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Bound in at end is J Selden's Brief discourse touching the office of Lord Chancellor 1671

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in a Still. He was the firſt Heir of the *White*, and the *Red Roſe*; So that there was no diſcontented Party now left in the *Kingdom*; but all Mens Hearts turned towards him. And not only their Hearts, but their Eyes alſo: For he was the only Son of the *Kingdom*. He had no *Brother*, which though it be a comfortable thing, for *Kings* to have, yet it draweth the Subjects Eyes a little aſide: And yet being a married Man in thoſe young years, it promiſed hope of ſpeedy Iſſue, to ſucceed in the *Crown*. Neither was there any *Queen Mother*, who might ſhare any way in the Government, or claſh with his *Counſellours* for Authority, while the *King* intended his pleaſure. No ſuch thing, as any Great and Mighty *Subject*, who might any way eclipſe, or overſhade the *Imperial Power*. And for the people, and *State* in general, they were in ſuch lowneſs of obedience, as Subjects were like to yield, who had lived almoſt four and twenty years, under ſo politique a *King*, as his *Father*; Being alſo one who came partly in by the Sword; And had ſo high a Courage in all points of Regalitie; And was ever victorious in Rebellions, and Seditions of the *People*. The *Crown* extreamly rich, and full of Treaſure, and the *Kingdom* like to be ſo in ſhort time. For there was no War, no Dearth, no Stop of Trade, or Commerce, it was only the *Crown*, which had ſucked too hard, and now being full, and upon the head of a young *King*, was like to draw leſs. Laſtly, he was Inheriter of his Fathers Reputation, which was great throughout the World. He had ſtreight Alliance, with the two Neighbour States, an ancient Enemy in former times, and an ancient Friend, *Scotland*, and *Burgundy*. He had Peace and Amity with *France*, under the Aſſurance, not only of Treaty and League, but of Neceſſity and Inhability in the *French* to do him hurt, in reſpect that the *French Kings* Deſigns were wholly bent upon *Italy*. So that it may be truly ſaid; there had ſcarcely been ſeen, or known, in many Ages, ſuch a rare Concurrence of Signs, and Promiſes of a happy, and flouriſhing Reign to enſue, as were now met in this young *King*, called, after his *Fathers* name, *HENRY* the Eighth, *&c.*

FINIS.

THE NATURAL AND EXPERIMENTAL HISTORY OF WINDS, &c.

Written in Latine by the Right Honourable
FRANCIS Lord *Verulam*, Viſcount S^t *Alban.*

Tranſlated into Engliſh by *R. G.* Gent.

LONDON,
Printed for *Anne Moſeley*, and *Tho. Baſſet* at the *George*
in *Fleet-ſtreet*, 1671.

TO THE

Moſt Illuſtrious,

AND

EXCELLENT PRINCE,

CHARLES,

Son and Heir to the High and Mighty

KING *JAMES.*

I Humbly preſent unto your Highneſs the firſt fruits of our Natural Hiſtory; A thing exceeding little in quantity, like a grain of Muſtard-ſeed, but yet a pledg of thoſe things which God willing ſhall enſue. For we have bound our ſelves, as by a vow, every Month that God ſhall of his goodneſs pleaſe (whoſe glory it ſets forth as it were in a new Canticle or Song) to prolong our life, to ſet out one or more parts of it, according as their length and difficulty ſhall prove more or leſs. Others may peradventure (moved by our example) be moved to the like induſtry; eſpecially when they ſhall clearly perceive what is in hand. For in a Natural Hiſtory *which is good and well ſet out, are the Keys both of Sciences and works. God preſerve your Highneſs long in ſafety,*

Your Highneſs humble and devoted
Servant

FRAN. S^{t} ALBAN.

THE

NATURAL and EXPERIMENTAL HISTORY for the making up of Philoſophy: Or Experiments of the Univerſe: Which is the third part of the *INSTAURATIO MAGNA.*

MEn are to be intreated, adviſed and adjured even by their Fortunes, to ſubmit their minds, and ſeek for Knowledg in the greater World; and likewiſe to caſt away ſo much as the thought of Philoſophy, or at leaſt to hope but for ſlender and ſmall fruits thereof, until a diligent and approved Natural and Experimental Hiſtory be acquired and made up: For what would theſe ſhallow brains of men, and theſe potent trifles have? There were among the Ancient numerous Opinions of Philoſophers, as of *Pythagoras*, *Philolaus*, *Xenophanes*, *Heraclitus*, *Empedocles*, *Parmenides*, *Anaxagoras*, *Leucippus*, *Democritus*, *Plato*, *Ariſtotle*, *Theophraſtus*, *Zeno*, and others. All theſe made up Arguments of Worlds, as of Fables, according to their own Fancies, and recited and publiſhed thoſe Fables; whereof ſome indeed were more handſome and probable, and ſome again moſt harſh. But in our Ages, by means of Colledges and Schools Diſciplines, wits are ſomewhat more reſtrained; yet have they not quite ceaſed:: *Patricius*, *Teleſius*, *Brunus*, *Severine* the Dane, *Gilbertus* an Engliſhman, and *Campanella* did ſet foot upon the Stage, and acted new Fables, neither much applauded, nor of any Elegant Argument or Subject. But do we wonder at theſe things? as though ſuch Sects and Opinions, might not in an infinite number ariſe in all ages? For neither is there, nor ever will be any end or limit for theſe things. One ſnatches at one thing, another is pleaſed with another; there is no dry nor clear ſight of any thing, every one plays the Philoſopher out of the ſmall Treaſures of his own Fancy, as it were out of *Platos* Cave; the more ſublime wits more acutely, and with better ſucceſs: the duller with leſs ſucceſs but equal obſtinacy: and not long ſince by the diſcipline of ſome learned (and as things go now excellent) men, Sciences are bounded within the limits of ſome certain Authors which they have ſet down, impoſing them upon old men, and inſtilling them into young. So that now (as *Tullie* cavilled upon *Cæſars* Conſulſhip) the ſtar *Lyra* or *Harpe* riſeth by an Edict, and Authority is taken for truth, not truth for Authority. Which kind of order, and diſcipline is very convenient for our preſent uſe; but baniſheth thoſe which are better. For we both ſuffer for, and emulate our firſt Parents ſin. They deſired to be like unto God, and their poſterity much more: for we create new worlds, go before nature and command it. We muſt have all things to be ſo as may agree with our folly, not to Divine wiſdome, nor as they are found to be in themſelves: neither can I ſay which we reſt moſt, our wits, or the things themſelves: but certainly we ſet the ſtamps and ſeals of our own Images upon Gods Creatures, and works, and never carefully look upon and acknowledg the Creators ſtamps. Therefore we do not without cauſe again ſtrive for the domination over the Creatures. For whereas even after the fall of man, he had ſome kind of domination left him over reluctant Creatures, that he might tame and ſubdue them by true and ſolid arts; we have for the moſt part loſt that alſo through our own inſolencie, becauſe we will be like unto God, and follow the dictates of our own reaſon. Wherefore if there be any humility towards the Creator, any reverence, and magnifying of his works, any charity in men, or care to releaſe them out of their neceſſities and miſeries, if there be any love of truth in natural things, hatred of darkneſs, and a deſire of purifying the underſtanding, men are to be again and again deſired, that caſting off, or at leaſt laying aſide for a while, theſe flying and prepoſterous Philoſophies, which have ſet the *Theſes* before the *Hypopheſes*, or ſuppoſitions before ſolid grounds, have captivated experience, and triumphed over the works of God, they would humbly and with a certain reverence draw near and turn over the great Volume of the Creatures, ſtop and meditate upon it: and being cleanſed and free from opinions, handle them choicely and entirely. This is the ſpeech and language that went out into all the ends of the World, and ſuffered not in the confuſion of *Babel*. Let men learn this, and becomming children again and Infants, not ſcorn to take A. B. C. thereof in hand, and in finding and ſearching out the interpretation of it, let them ſpare no labour, but let them perſiſt and go on, and even die in the queſt of it. Seeing therefore that in our Inſtauration we have placed the Natural Hiſtory (ſuch as it is in order to our ends) in the third part of the work: we have thought fit to prevent this thing, and fall upon it immediately. For although in our Organon, there are many things of eſpecial conſequence to be finiſhed, yet we think it fitting rather to promote or ſet forward the general work of Inſtauration in many things, then to perfect it in a few, always deſiring with extream fervency (ſuch as we are confident God puts in the minds of men) to have that which was never yet attempted, not to be now attempted in vain. Likewiſe there came this thought into my mind, namely, that there are queſtionleſs in *Europe* many capable, free, ſublimed; ſubtile, ſolid, conſtant wits; and what if any one endued with ſuch a wit, do betake himſelf to the uſe and manner of our Organon, and approve of it? yet hath he nothing to do nor knows not how to addreſs himſelf to, or fit himſelf for Philoſophy. If it were a thing which might be effected by reading of Philoſophy books, diſputation, or meditation; that man (whoſoever it be) might ſufficiently, and abundantly perform it: But if we remit him (as indeed we do) to Natural Hiſtory, and experiments of arts, he is gravelled or ſticks in the mire; it is not his intention, he hath no time, nor will not be at the charge: yet we muſt not deſire to have men caſt off old things, before they have gotten new. But after a copious, and faithful Hiſtory of Nature and Arts is gathered and digeſted, and as it were ſet, and laid open before mens eyes, there is no ſmall hope that ſuch great wits as we have before ſpoken of (ſuch as have been in ancient Philoſophers, and are at this day frequent enough) having been heretofore of ſuch efficacy, that they could out of corke or a little ſhell (namely by thin and frivilous experience)build certain little boats for Philoſophy,gallant enough for Art and ſtructure ; how much more gallant and ſolid ſtructures will they make, when they have found a whole wood, and ſtuff enough: and that though they had rather go on in the old way,then make uſe of our Organons way which(in our opinion)is either the only,or the beſt way. So that the caſe ſtands thus: our *Organon* (though perfect)could not profit much without the Natural Hiſtory; but our Natural Hiſtory without the *Organon* might much advance Inſtauration,or renewing of Sciences. Wherefore we have thought it beſt and moſt adviſedly to fall upon this before any thing elſe. God the Maker,Preſerver, and Renewer of the Univerſe, guide and protect this Work,both in its aſcent to his own glory,and in its deſcent to the good of man, through his good-will towards man, by his only begotten Son God with us.

The

The Rule of this preſent Hiſtory.

THough we have ſet down towards the end of that part of our *Organon*, which is come forth, Precepts concerning the Natural and experimental Hiſtory: yet we have thought good to ſet down more exactly and briefly, the form and rule of this Hiſtory which we now take in hand. To the Titles comprehended in the Catalogue, which belong to the Concretes, we have added the Titles of the Abſtract Natures; of which, as of a reſerved Hiſtory, we made mention in the ſame place. Theſe are the various Figurations of the matter, or forms of the firſt Claſſis, ſimple Motions, ſums of Motions, meaſures of Motions, and ſome other things: of theſe we have made a new Alphabet, and placed it at the end of this Volume. We have taken Titles (being no way able to take them all) not according to order, but by choice: thoſe namely, the Inquiſition of which either for uſe was moſt of weight, or for abundance of Experiments moſt convenient, or for the obſcurity of the thing moſt difficult and noble; or by reaſon of the diſcrepancy of Titles among themſelves, moſt open to examples. In each Title, after a kind of an entrance or Preface, we preſently propound certain particular Topicks or Articles of Inquiſition, as well to give light to the preſent Inquiſition, as to encourage a future. For we are Maſters of Queſtions, but not of things; yet we do not in the Hiſtory preciſely obſerve the order of Queſtions, leaſt that which is for an aid and aſſiſtance ſhould prove a hinderance.

The Hiſtories and Experiments always hold the firſt place; and if they ſet forth any enumeration, and Series of particular things, they are made up in Tables, or if otherwiſe, they are taken up ſeverally.

Seeing that Hiſtories and Experiments do oftentimes fail us, eſpecially thoſe which give light, and Inſtances of the Croſs, by which the underſtanding may be informed of the true cauſes of things, we give Precepts of new Experiments, as far as we can ſee them fitting in our mind, for that as is to be enquired: and theſe Precepts are deſigned like Hiſtories. For what other means is left to us, who are the firſt that come into this way? We unfold and make plain the manner of ſome Experiments that are more quaint and ſubtile, that there may be no error, and that we may ſtir up others to find out better and more exact ways. We enterweave Monitions and Cautions of the Fallacies of things, and of ſuch Errors, and Scruples, as may be found in the Inquiry, that all Fancies, and as it were Apparitions may be frighted away, as by an Exorciſme or ſpell.

We joyn thereunto our Obſervations upon Hiſtory and experiments, that the Interpretation of the Nature may be the readier.

We Interpoſe ſome Comments, or as it were Rudiments of the Interpretations of Cauſes, ſparingly, and rather ſuppoſing what may be, than poſitively defining what is.

We preſcribe and ſet down Rules, but moveable ones, and as it were inchoated Axiomes which offer themſelves unto us as we enquire, not as we deciſorily pronounce, for they are profitable, though not altogether true.

Never forgetting the profit of man-kind (though the light be more worthy than thoſe things which be ſhewen by it) we offer to mans attention and practiſe certain Eſſays of Practice, knowing that mens ſtupidity is ſuch, and ſo unhappy, that ſometimes they ſee not, and paſs over things which lye juſt in their way.

We ſet down works and things impoſſible, or at leaſt which are not yet found out, as they fall under each Title: and withal thoſe vvhich are already found out, and are in mens povver; and vve adde to thoſe impoſſible, and not yet found out things, ſuch as are next to them, and have moſt affinity vvith them, that vve may ſtir up, and vvithall incourage humane induſtry.

It appears, by the foreſaid things, that this preſent Hiſtory doth not only ſupply the place of the third part of the Inſtauration, but alſo is a not deſpicable preparation to the fourth, by reaſon of the Titles out of the Alphabet and Topicks, and to the ſixth, by reaſon of the larger Obſervations, Commentations, and Rules.

PARTICULAR TOPICKS:

OR,

Articles of Inquiſition Concerning the Winds.

The Names of Winds.

Deſcribe or ſet down the Winds according to the Sea-mans induſtry; and give them Names either new or old, ſo that you keep your ſelf conſtant to them.

Winds are either general or preciſe, either peculiar, or free. I call them general which always blow; preciſe, thoſe which blow at certain times: Attendants or Peculiar, thoſe which blow moſt commonly: Free Winds, thoſe which blow indifferently, or at any time.

General Winds.

2. Whether there be any General Winds, which are the very ſelf motion of the Air; and if there be any ſuch, in order to what motion, and in what places they blow?

Preciſe, or fixed Winds.

3. What Winds are Aniverſary or yearly winds, returning by turns; and in what Countrys? Whether there be any Wind ſo preciſely fixed, that it returns regularly at certain days and hours, like unto the flowing of the Sea?

Attending or Peculiar Winds.

4. What Winds are peculiar, and ordinary in Countrys, which obſerve a certain time in the ſame Countrys; which are Spring winds, and which are Summer winds; which Autumnal, which Brumal, which Equinoctial, which Solſtitial; which are belonging to the Morning, which to Noon, which to the Evening, and which to the Night.

5. What winds are Sea winds, and what winds blow from the Continent? and mark and ſet down the differences of the Sea and Land winds carefully, as well of thoſe which blow at Land and Sea, as of thoſe which blow from Land and Sea.

Free Winds.

6. Whether winds do not blow from all parts of Heaven?

Winds do not vary much more in the parts of Heaven from which they blow, than in their own qualities. Some are vehement, ſome mild, ſome conſtant, ſome mutable; ſome hot, ſome cold; ſome moiſtning and diſſolving; ſome drying and aſtringent; ſome gather clouds and are rainy, and peradventure Stormy: ſome diſperſe the clouds, and are clear.

Divers qualities of Winds.

7. Enquire and give accompt, which are the winds of all the forenamed ſorts or kinds, and how they vary according to the regions and places.

There are three local beginnings of Winds, either they are thrown and caſt down from above, or they ſpring out of the Earth, or they are made up of the very body of the Air.

Local beginnings of Winds.

8. According to theſe three beginnings enquire concerning winds: Namely, which are thrown down, out of that which they call the middle Region of the Air; which breath out of the concavities of the earth, whether they break out together; or whether they breath out of the Earth imperceiveably, and ſcattering, and afterwards gather together, like rivolets into a River. Finally, which are ſcatteringly engendred from the ſwellings and dilatations of the neighbouring Air?

Neither are the generations of the winds, original only, for ſome there are alſo accidental, namely by the compreſſions or reſtraints of the Air, and by the percuſſions and repercuſſions of it.

Accidental Generations, and Production of Winds.

9. Enquire concerning theſe accidental Generations of winds: They are not properly generations of winds; for they rather increaſe and ſtrengthen winds, than produce and excite them.

Hitherto of the community of winds. There are alſo certain rare and prodigious winds, ſuch as are called tempeſts, whirle-winds, and ſtorms: Theſe are above ground. There are likewiſe ſome that are ſubterraneal and under ground, whereof ſome vaporous and Mercurial, they are perceiveable in Mines: Some are ſulphurous, they are ſent out, geting an iſſue by Earthquakes, or do flame out of fiery Mountains.

Extraordinary Winds, and ſudden Blaſts.

10. Enquire concerning ſuch rare and prodigious winds, and of all miraculous and wonderful things done by winds.

From the ſeveral ſorts of winds let the Inquiſition paſs to thoſe things which contribute towards the winds, (for we will ſo expreſs it, becauſe the word Efficient ſignifies more, and the word concomitant leſs than we mean) and to thoſe things which ſeem to raiſe, or to appeaſe the winds.

Things

Things contributing, or making for the Winds, and raiſing, and appeaſing them.

11. Enquire ſparingly concerning Aſtrological conſiderations of winds, neither care thou for the over-curious Schemes of the heaven, only do not neglect the more manifeſt Obſervations of winds riſing, about the riſing of ſome ſtars, or about the Eclipſes of the Luminaries, or Conjunctions of Planets; nor much leſs on thoſe which depend on the courſes of the Sun and Moon.

12. What Meteors of ſeveral ſorts do contribute or make for winds, what the earth-quakes, what rain, what the skirmiſhing of winds one with another? for theſe things are linked together, and one draws on the other.

13. What the diverſity of Vapours and exhalations contributes towards the winds? and which of them do moſt engender winds; and how far the Nature of winds doth follow theſe its materials.

14. What thoſe things which are here upon the earth, or are there done do contribute towards the winds; what the hills and the diſſolutions of Snow upon them; what thoſe maſſes of Ice which ſwim upon the Sea, and are carried to ſome place; what the differences of ſoil and land (ſo it be of ſome large extent;) what Ponds, Sands, Woods, and Champion ground; what thoſe things which we men do here, as burning of Heath, and the like, doth contribute to the manuring of Land, the firing of Towns in time of War, the drying up of Ponds and Lakes; the continual ſhooting off of Guns, the ringing of many Bells together in great Cities, and the like? Theſe things and Acts of ours are but as ſmall ſtraws, yet ſomething they may do.

15. Enquire concerning all manner of raiſings, or allayings of winds, but be ſparing in fabulous and ſuperſtitious cauſes.

From thoſe things which make for the winds, let the Inquiſition proceed to enquire of the bounds of the winds, of their Height, Extention, and Continuance.

The bounds of Winds.

16. Enquire carefully of the Height, or elevation of winds, and whether there be any tops of mountains to which the winds do not reach; or whether Clouds may be ſeen ſometimes to ſtand ſtill, and not move, when the winds at the ſame time blow ſtrongly upon the earth.

17. Enquire diligently of the ſpaces or rooms which the winds take up at once, and within what bounds they blew? As for example, if the ſouth wind blew in ſuch a place, whether it be known certainly, that at the ſame time the North wind blew ten miles off? And contrariwiſe into how narrow and ſtraight bounds the winds may be reduced, ſo that winds may paſs as it were through Channels; which ſeems to be done in ſome whirlwinds.

18. Enquire for how long time, very much, ordinary, or little time winds uſe to continue, and then ſlack, and as it were expire and die. Likewiſe how the riſing and beginning of winds uſeth to be; what their languiſhing or ceſſation is, whether ſuddenly, or by degrees, or how?

From the bounds of the winds let your Inquiſition paſs over to the ſucceſſions of winds, either amongſt themſelves, or in reſpect of rain and ſhowrs; for when they lead their rings it were pretty to know the order of their dancing.

Succeſſions of Winds.

19. Whether there be any more certain rule or obſervation concerning the ſucceſſions of winds one to another, or whether it have any relation to the motion of the Sun, or otherwiſe: if it have any, what manner of one it is?

20. Enquire concerning the ſucceſſion and the alteration, or taking turns of the winds, and rain, ſeeing it is ordinarily, and often ſeen, that rain lays the wind, and the wind doth diſperſe the rain.

21. Whether after a certain term and period of years, the ſucceſſion of winds begin anew; and if it be ſo, what that period is, and how long?

From the ſucceſſion of the winds, let the Inquiſition paſs to their motions: and the motions of winds are comprehended in ſeven Inquiſitions; whereof three are contained in the former Articles, four remain as yet untouched. For we have enquired of the motion of winds divided into the ſeveral Regions of the Heaven; alſo of the Motion upon three lines, upward, downward, and laterally: Likewiſe of the accidental motion of compreſſions or Reſtraints. There remain the fourth of Progreſſions or going forward: the fifth of Undulation, or waving: the ſixth of conflict or skirmiſh: the ſeventh in humane Inſtruments and Engines.

Divers Motions of the Winds.

22. Seeing Progreſſion is always from ſome certain place or bound; enquire diligently, or as well as thou canſt concerning the place of the firſt beginning, and as it were the ſpring of any wind. For winds ſeem to be like unto Fame, for though they make a noiſe and run up and down, yet they hide their heads amongſt the Clouds: ſo is their Progreſs; as for example, if the vehement Northern wind which blew at *York* ſuch a day, do blow at *London* two days after.

23. Omit not the Inquiſition of Undulation of winds. We call Undulation of winds that motion by which the wind in or for a little ſpace of time riſes and abates, as the waves of the water; which Turns may eaſily be apprehended by the hearing of them in houſes: and you muſt ſo much the rather mark the differences of Undulation, or of Furrowing between the water and the air, becauſe in the air and winds, there wants the Motion of gravity or weight, which is a great part of the cauſe of the waves riſing in the water.

24. Enquire carefully concerning the Conflict, and meeting of winds, which blow at one and the ſame time: Firſt, whether at the ſame time there blow ſeveral Original winds? (for we do not ſpeak of reverberated winds) which if it comes to paſs, what Windings they engender and bring forth in their motion, and alſo what Condenſations, and Alterations they produce in the body of the Air?

25. Whether one wind blow above at the ſame time, as another blows here below with us? For it hath been obſerved by ſome, that

ſometimes the Clouds are carried one way, when the Weather-cock upon a Steeple ſtands another. Alſo that the Clouds have been driven by a ſtrong gale, when we here below have had a great calm.

26. Make an exact particular deſcription of the motion of the winds, in driving on Ships with their Sails.

27. Let there be a Deſcription made of the motion of the winds in the ſails of Ships, and the ſails of Wind-mills, in the flight of Hawks and Birds; alſo in things that are ordinary, and for ſport, as of diſplayed Colours, flying Dragons, Duels with winds, *&c.*

From the motions of winds, let the Inquiſition paſs to the force and power of them.

Of the power of Winds.

28. What winds do, or can do concerning Currents or Tides of waters, in their keepings back, puttings forth, or inlets and overflowings.

29. What they do concerning Plants and Inſects, bringing in of Locuſts, Blaſtings, and Mill-dews.

30. What they effect concerning Purging or Clearing, and infecting of the air, in Plagues, Sickneſſes, and Diſeaſes of Beaſts.

31. What they effect concerning the conveying to us things (which we call) ſpiritual, as ſounds, rayes, and the like.

From the powers of winds let the Inquiſition paſs to the Prognoſticks of winds, not only for the uſe of Predictions, but becauſe they lead us on to the cauſes: For Prognoſticks do either ſhew us the preparations of things, before they be brought into action; or the beginnings before they appear to the ſenſe.

Prognoſticks of Winds.

32. Let all manner of good Prognoſticks of winds be carefully gathered together (beſides Aſtrological ones, of which we ſet down formerly, how far they are to be enquired after) and let them either be taken out of Meteors, or Waters, or inſtincts of Beaſts, or any other way.

Laſtly, cloſe up the Inquiſition, with enquiring after the imitations of winds, either in Natural or Artificial things.

Imitations of Winds.

33. Enquire of the Imitations of winds in Natural things; ſuch as breaths incloſed within the bodies of living Creatures, and breaths within the receptacles of diſtilling Veſſels.

Enquire concerning made Gales, and Artificial winds, as Bellows, Refrigeratories, or coolers in Parlours, or Dining rooms, *&c.*

Let the Heads or Articles be ſuch: Neither is it unknown to me that it will be impoſſible to anſwer to ſome of theſe according to the ſmall quantity of experience that we have: But as in civil cauſes, a good Lawyer knows what Interrogatories the Cauſe requires to have witneſſes examined upon; but what the witneſſes can anſwer he knows not. The ſame thing is incident to us in Natural Hiſtory. Let thoſe who come after us endeavour for the reſt.

THE HISTORY.

The Names of VVinds.

To the firſt Article.

WE give Names to Winds , rather as they are numbred in their order and degrees, than by their own Antiquity , this we do for memories and perſpicuities ſake. But we adde the old words alſo, becauſe of the aſſenting voices or opinions of old Authors , of which having taken (though with ſomewhat a doubtful judgment) many things, they will hardly be known , but under ſuch names as themſelves have uſed. Let the general diviſion be this: Let Cardinal winds be thoſe which blow from Corners or Angles of the World : Semicardinal, thoſe which blow in the half-wards of thoſe; and Median Winds thoſe which blow between theſe half-wards : Likewiſe of thoſe which blow betwixt theſe half-wards, let thoſe be called Major Medians, which blow in a Quadrant or fourth part of theſe diviſions: the leſſer Medians are all the reſt. Now the particular diviſion is that which follows.

Cardinal.	*North.*
	North and by Eaſt.
Med.Maj.	*North , North-Eaſt , or Aquilo.*
	North Eaſt and by North , or Meſes.
Semi-Card.	*North Eaſt.*
	North Eaſt and by Eaſt.
Med.Maj.	*Eaſt North Eaſt , or Cæcias.*
	Eaſt and by North.

Cardinal.	*Eaſt, or Subſolanus.*
	Eaſt by South.
Med.Maj.	*Eaſt South Eaſt, or Vulturnus.*
	South Eaſt & by Eaſt.
Semi-Card.	*South Eaſt.*
	South Eaſt and by South.
Med. Maj.	*South South Eaſt , or Phænicias.*
	South and by Eaſt.

Cardinal.	*South.*
	South & by Weſt.
Med. Maj.	*South South Weſt , or Libonotus.*
	South Weſt and by South.
Semi Card.	*South Weſt, or Libs.*
	South Weſt and by Weſt.
Med. Maj.	*Weſt South Weſt, or Africus.*
	Weſt and by South.

Cardinal.	*Weſt, or Favonius.*
	Weſt and by North.
Med.Maj.	*Weſt North Weſt, or Corus.*
	North Weſt and by Weſt.
Semi Card.	*North Weſt.*
	North Weſt and by North, or Thraſcias.
Med. Maj.	*North North Weſt , or Circius.*
	North and by Weſt.

There are alſo other Names of winds. *Apeliotes* the Eaſt wind, *Argeſtes*, the South Weſt, *Olympias*, the North Weſt, *Scyron*, the South Eaſt, *Helleſpontius*, the Eaſt North Eaſt, for theſe we care not. Let it ſuffice, that we have given conſtant and fixed names of winds, according to the order and diſpoſition of the regions of the Heavens: we do not ſet much by the Comments of Authors; ſince the Authors themſelves have little in them.

Free Winds.

To the ſixth Article.

1 THere is not a Region of the Heaven from whence the wind doth not blow. Yea, if you divide the Heaven into as many Regions as there be degrees in the Horizon, you ſhall find winds ſometimes blowing from every one of them.

2. There are ſome whole Countries, where it never rains, or at leaſt very ſeldom; but there is no Country where the wind doth not blow, and that frequently.

General Winds.

To the ſecond Article.

1. COncerning general winds Experiments are plain, and it is no marvel, ſeeing that (eſpecially within the Tropicks) we may find places condemned among the Ancients.

It is certain, that to thoſe who ſail between the Tropicks, in a free and open ſea, there blows a conſtant and ſetled wind (which the ſeamen call a Breeze) from Eaſt to Weſt. This wind is not of ſo little force, but that partly by its own blowing, and partly by its guiding the current of the Sea, it hindreth Sea-men from coming back again the ſame way they went to *Peru*.

2. In our Seas in *Europe*, when it is fair dry weather, and no particular winds ſtirring, there blows a ſoft kind of gale from the Eaſt, which followeth the Sun.

3. Our common Obſervations do admit that the higher Clouds are for the moſt part carried from Eaſt to Weſt; and that it's ſo likewiſe when here below upon the earth either there is a great calm, or a contrary wind; and if they do not ſo always, it is becauſe ſometimes particular winds blow aloft, which overwhelm this general wind.

A *Caution.* If there be any ſuch general wind, in order to the motion of the Heaven, it is not ſo firm nor ſtrong, but that it gives way to particular winds. But it appears moſt plainly amongſt the Tropicks, by reaſon of the larger circles which it makes: And likewiſe it is ſo when it blows on high, for the ſame cauſe, and by reaſon of its free courſe. Wherefore if you will take it without the Tropicks, and near the earth, (where it blows moſt gently and ſlowly) make trial of it in an open and free air, in an extream calm, and in high places, and in a body which is very moveable, and in the after-noon; for at that time the particular Eaſtern wind blows more ſparingly.

Injunction. Obſerve diligently the Vains and Weather-cocks upon the tops and Towers of Churches, whether in extream calms they ſtand continually towards the Weſt or not.

An Indirect Experiment.

4. It is certain, that here with us in *Europe*, the Eaſtern wind is drying and ſharp: the Weſt wind contrariwiſe moiſt and nouriſhing. May not this be by reaſon that (it being granted, that the Air moves from Eaſt to Weſt) it muſt of neceſſity be that the Eaſt wind, whoſe blaſt goeth the ſame way, muſt needs diſperſe and attenuate the Air, whereby the Air is made biting and dry; but the weſtern wind which blows the contrary way, turns the Airs back upon it ſelf, and thickens it, whereby it becomes more dull, and at length moiſt.

An Indirect Experiment.

5. Conſider the Inquiſition of the motion, and flowing of waters, whether they move from Eaſt to Weſt; for if the two extreams Heaven and Waters delight in this Motion, the Air which is in the midſt will go near to participate of the ſame.

Caution. We call the two laſt Experiments indirect, becauſe they do directly ſhew the thing which we aim at, but by conſequence, which we alſo gladly admit of when we want direct Experiments.

Injunction. That the Breeze blows plentifully between the Tropicks, is moſt certain; the cauſe is very ambiguous. The cauſe may be, becauſe the Air moves according to the Heaven: But without the Tropicks almoſt unperceiveably, by reaſon of the ſmaller Circles which it makes within the Tropicks manifeſtly, becauſe it makes bigger Circles. Another cauſe may be, becauſe all kind of heat dilates and extends the Air, and doth not ſuffer it to be contained in its former place; and by the dilation of the Air, there muſt needs be an impulſion of the contiguous Air, which produceth this Breeze, as the Sun goes forward: and that is more evident within the Tropicks, where the Sun is more ſcorching, without it is hardly perceived. And this ſeems to be an inſtance of the Croſs, or a deciſory inſtance. To clear this doubt you may enquire, whether the Breeze blow in the night or no; for the wheeling of the Air continues alſo in the night, but the heat of the Sun does not.

6. But it is moſt certain that the Breeze doth not blow in the night, but in the morning, and when the morning is pretty well ſpent; yet that inſtance doth not determine the Queſtion: whether the nightly condenſation of the Air, (eſpecially in thoſe Countrys where the days and nights are not more equal in their length than they are differing in their heat and cold) may dull and confound that Natural Motion of the Air, which is but weak.

If the air participates of the motion of the Heaven, it does not only follow, that the Eaſt wind concurs with the motion of the Air, and the Weſt wind ſtrives againſt it; but alſo that the North wind blows as it were from above, and the South wind as from below here in our Hemiſphere, where the Antartick Pole is under ground, and the Artick Pole is elevated; which hath likewiſe been obſerved by the Ancients, though ſtaggeringly and obſcurely: But it agrees very well with our modern Experience; becauſe the Breeze (which may be a motion of the air) is not a full Eaſt, but a North-Eaſt wind.

Stayed

Stayed or certain Winds.

To the third Article.

Connexion.

AS in the Inquiſition of General winds, men have ſuffered and been in darkneſs, ſo they have been troubled with a *Vertigo* or giddineſs concerning ſtaid and certain Winds. Of the former they ſay nothing, of the latter, they talk up and down and at random. This is the more pardonable, the thing being various: for theſe ſtayed winds do change and alter according to the places where they be: the ſame do not blow in *Egypt*, *Greece*, and *Italy*.

1. That there are ſtayed winds in ſome places, the very name that is given them doth declare it, as the other name of *Eteſiaes* means Anniverſary or yearly winds.

2. The Ancients attributed the cauſe of the over-flowing of *Nilus* to the blowing of the *Eteſian* (that is to ſay Northern) winds at that time of the year which did hinder the River's running into the Sea, and turned the ſtream of it back.

3. There are Currents in the Sea, which can neither be attributed to the natural motion of the Ocean, nor to the running down from higher places, nor the ſtraightneſs of the oppoſite ſhoars, or to Promontories running out into the Sea, but are meerly guided and governed by theſe ſtayed winds.

4. Thoſe who will not have *Columbus* to have conceived ſuch a ſtrong opinion concerning the Weſt-Indies by the relation of a *Spaniſh* Pilot, and much leſs believe that he might gather it out of ſome obſcure foot-ſteps of the Ancients have this refuge; that he might conjecture there was ſome Continent in the Weſt by the certain and ſtayed winds which blew from them towards the ſhoars of *Luſitania*, or *Portugal.* A doubtful, and not very probable thing; ſeeing that the voyage of winds will hardly reach ſo large a diſtance. In the mean time there is great honour due to this Inquiſition, if the finding of this new world be due to one of thoſe Axioms or Obſervations, whereof it comprehends many.

5. Whereſoever are high and ſnowy Mountains, from thence blow ſtayed winds, until that time as the ſnow be melted away.

6. I believe alſo that from great Pools which are full of water in the Winter, there blows ſtayed winds in thoſe ſeaſons, when as they begin to dry up with the heat of the Sun. But of this I have no certainty.

7. Whereſoever Vapours are engendred in abundance, and that at certain times, be ſure that ſtayed winds will blow there at the ſame times.

8. If ſtayed and certain winds blow any where, and the cauſe cannot be found near at hand, aſſure your ſelf that thoſe certain winds are ſtrangers, and come from far.

9. It hath been obſerved, that ſtayed winds do not blow in the night time, but do riſe about three hours after Sun-riſing. Surely ſuch winds are tired as it were with a long journy, that they can ſcarcely break through the thickneſs of the night Air, but being ſtirred up again by the riſing of the Sun, they go forward by little and little.

10. All ſtayed winds (unleſs they blow from ſome neighbouring places) are weak, and yield unto ſudden winds.

11. There are many ſtayed winds which are not perceivable, and which we do not obſerve, by reaſon of their weakneſs, whereby they are overthrown by the freewinds. Wherefore in the winter they are hardly taken notice of, when the free winds wander moſt: but are more obſerveable in the Summer, when thoſe wandring winds grow weak.

12. In *Europe* theſe are the chief ſtayed winds, Northwinds from the Solſtice, and they are both fore-runners and followers of the Dog-ſtar. Weſt-winds from the Equinoctial in Autumn, Eaſtwinds from the Spring Equinoctial; as for the winter Solſtice, there is little heed to be taken of it, by reaſon of the varieties.

13. The winds called *Ornithii* or Bird winds, had that name given them, becauſe they bring Birds out of cold Regions beyond the Sea, into warm Climates; and they belong not to ſtayed winds, becauſe they for the moſt part keep no punctual time: and the Birds they for the convenience of them, whether they come ſooner or later: and many times when they have begun to blow a little; and turn, the birds being forſaken by it, are drowned in the ſea, and ſometimes fall into ſhips.

14. The returns of theſe certain or ſtayed winds are not ſo preciſe at a day or an hour, as the flowing of the Sea is. Some Authors do ſet down a day, but it is rather by conjecture than any conſtant obſervation.

Cuſtomary or Attending Winds.

Of the fourth and fifth Articles.

Connexion.

THe word of attending winds is ours, and we thought good to give it, that the Obſervation concerning them be not loſt; nor confounded. The meaning is this, Divide the year if you pleaſe (in what Country ſoever you be) into three, four, or five parts, and if any one certain wind blow, then two, three, or four of thoſe parts, and a contrary wind but one; we call that wind which blows moſt frequently, The cuſtomary, or Attending wind of that Country, and likewiſe of the times.

1. The South and Northwinds are attendants of the world, for they with thoſe which are within their Sections or Diviſions, blow oftner over all the world, than either the Eaſt or the Weſt.

2. All free winds (not the cuſtomary) are more attendant in the winter than in the ſummer; but moſt of all in the Autumn and Spring.

3. All free winds are attendants rather in the Countries without the Tropicks, and about the Polar Circles, than within: for in frozen and in torrid Countrys, for the moſt part they blow more ſparingly, in the middle Regions they are more frequent.

4. Alſo all free winds, eſpecially the ſtrongeſt and moſt forcible of them, do blow oftner and more ſtrongly, morning and evening, than at noon and night.

5. Free winds blow frequently in hollow places, and where there be Caves, than in ſolid and firm ground.

Injunction. Humane diligence hath almoſt ceaſed and ſtood ſtill in the obſervation of attending winds in particular places, which notwithſtanding ſhould not have been, that Obſervation being profitable for many things. I remember I asked a certain Merchant, (a wiſe and diſcreet man) who had made a Plantation in *Greenland*, and had wintred there, why that Country was ſo extream cold, ſeeing it ſtood in a reaſonable temperate Climate. He ſaid, it was not ſo great as it was reported; but that the cauſe was twofold: One was, that the maſſes and heaps of Ice, which came out of the *Scithian* ſea were carried thither. The other, (which he alſo thought to be the better reaſon) was, becauſe the Weſt wind there blows many parts of the year, more than the Eaſt wind; as alſo, (ſaid he) it doth with us; but there it blows from the Continent, and cold, but with us from the Sea and warmiſh. And (ſaid he) if the Eaſt wind ſhould blow here in *England* ſo often & conſtantly as the Weſtwind does there, we ſhould have far colder weather, even equal to that as is there.

6. The Weſt-winds are attendants of the *Pomeridian* or afternoon hours: for towards the declining of the Sun, the winds blow oftner from the Eaſt, then from the Weſt.

7. The South-wind is attendant on the night; for it riſes and blows more ſtrongly in the night, and the North-wind in the day time.

8. But there are many and great differences between winds which are attendant on the ſea, and thoſe which are attendant upon the land. That is one of the chief which gave *Columbus* occaſion to find out the new world; namely, that Sea-winds are not ſtayed, but land winds are: for the Sea abounding in Vapors, which are indifferently every where winds are alſo engendred indifferently every where, and with great inconſtancy are carryed here and there, having no certain beginnings nor ſources. But the earth is much unlike for the the begetting of winds: ſome places are more efficacious to engender and increaſe winds, ſome leſs: wherefore they ſtand moſt from that part where they have their nouriſhment, and take their riſe from thence.

9. *Acoſta* is unconſtant in his own Poſition. He ſaith that at *Peru*, and the Sea coaſts of the South Sea, South winds do blow almoſt the whole year: and he ſaith in another place, that upon thoſe Coaſts ſea winds do blow chiefliest. But the South wind to them is a land wind, as likewiſe the North and Eaſt wind alſo, and the Weſt-wind is their only ſea wind. We muſt take that which he ſets down more certainly; namely, that the South-wind is an attending and familiar wind of thoſe Countries; unleſs peradventure in the name of the South Sea he hath corrupted his meaning, or his ſpeech, meaning the Weſt by the South, which blows from the South-ſea. But the Sea which they call the South-ſea, is not properly the South-Sea; but as a ſecond weſtern Ocean, being ſtretched out in the like ſituation as the *Atlantick* ſea is.

10. Sea winds are queſtionleſs more moiſt than land winds, but yet they are more pure, and will eaſilier, and with more equality be incorporated with the pure Air. For terreſtrial winds are ill compoſed, and ſmoaky. Neither let any one object, that they ought to be groſſer by reaſon of the ſaltneſs of the Sea. For the nature of terreſtrial ſalt doth not riſe in vapours.

Sea winds are luke-warm or cold, by reaſon of the two foreſaid qualities, humidity and pureneſs. For by humidity they mitigate the colds (for drineſs increaſeth both heat and cold) and with their pureneſs they cool. Therefore without the Tropicks they are luke-warm, within the Tropicks they are cold.

12. I believe that ſea winds are every where attendant upon particular Countries, eſpecially ſuch as ſtand upon the Sea coaſts: That is to ſay, winds blow more frequently from that ſide where the ſea is, by reaſon of the greater plenty of matter which winds have in the ſea, than in the land; unleſs there be ſome firm wind blowing from the land, for ſome peculiar reaſon. But let no man confound firm or ſtayed winds, with attendant winds: the attendants being always more frequent; but the ſtaid ones for the moſt part blowing more ſeldom: But that is common to them both, namely, to blow from that place from which they receive their nouriſhment.

13. Sea winds are commonly more vehement than land winds: yet when they ceaſe, the ſea is calmer from the ſhoars than near unto them; inſomuch, that Mariners to avoid calms, will ſometimes coaſt along the ſhoar, rather than lanch into the deep.

14. Winds which are called *Tropei*, that is to ſay, Retorted, namely, ſuch as when they have blown a little way, ſuddenly turn again, ſuch winds I ſay blow from the Sea towards the ſhoar: but retorted winds, and whirlwinds are moſt commonly in gulfs of Seas.

15. Some ſmall Gales blow for the moſt part about all great waters, and they are moſt felt in a morning; but more about Rivers than at Sea, becauſe of the difference which is between a land-gale, and a water-gale.

16. In places which are near the ſea trees bow and bend, as ſhunning the Sea Air: but that comes not through any averſeneſs in them: but ſea winds by reaſon of their humidity and thickneſs, are as it were more heavy and ponderous.

The Qualities and Powers of Winds.

To the 7, 28, 29, 30, 31 Articles.

Connexion.

Concerning the Qualities and Powers of winds men have made careleſs and various Obſervations: we will cull out the moſt certain, and the reſt, as too light, we will leave to the winds themſelves.

1. With us the ſouth wind is rainy, and the northern wind clear and fair, the one gathers together and nouriſhes the Clouds; the other ſcatters and caſts them off. Wherefore the Poets when they ſpeak of the Deluge, feign the Northern wind at that time to be ſhut up in priſon, and the ſouth wind to be ſent out with very large commiſſion.

2. The Weſt wind hath with us been held to be the wind which blew in the golden age, the companion of a perpetual Spring, and a cheriſher of Flowers.

3. *Paracelſus* his Schollars, when they ſought for a place for their three Principles in *Juno*'s Temple alſo, which is the Air, placed three, but found no place for the Eaſt-wind.

They Mercury *aſcribe to the South-winds*,
To the rich Weſtern blaſts the Sulphure Mines,
And rugged Boreas *blaſts the ſad ſalt finds.*

4. But with us in *England* the Eaſt wind is thought to be miſchievous, ſo that it goes for a Proverb, That when the wind is in the Eaſt, 'tis neither good for man nor beaſt.

5. The ſouth wind blows from the preſence of the Sun, the North from the abſence in our Hemiſpere. The Eaſt wind in order to the motion of the air: the Weſt wind from the Sea, the Eaſt wind from the Continent moſt commonly in *Europe* and the weſtern parts of *Aſia.* Theſe are the moſt radical and eſſential differences of winds; from which truly and really depend moſt of the Qualities and Powers of the winds.

6. The ſouth wind is not ſo Anniverſary, or yearly, nor ſo ſtayed as the Northern wind is, but more wandring and free: and when it is ſtayed, it is ſo ſoft and mild that it can ſcarcely be perceived.

7. The ſouth wind is lower, and more lateral and blowing of one ſide; the Northern wind is higher and blows from above: we do not mean the Polar elevation and depreſſion of which we have ſpoken formerly; but becauſe the North wind for the moſt part hath its beginnings higher, and the ſouth wind for the moſt part nearer to us.

8. The ſouth wind to us is rain (as we ſaid before) but in *Africk* it cauſes clear weather, but bringing great heat along with it, and not cold, as ſome have affirmed. In *Africk* it is pretty healthful, but to us, if the ſouth wind laſt long with fair weather, and without rain, it is very Peſtilent.

9. The ſouth winds and weſt winds do not engender vapours, but they blow from thoſe coaſts where there is great ſtore of them, by reaſon of the encreaſe of the Suns heat, which draws forth the vapours, and therefore they are rainy. But if they blow from dry places, which have no Vapours in them, they are fair. But notwithſtanding ſometimes they are pure, and ſometimes turbulent.

10. The ſouth and weſt wind here with us, ſeem to be confederate, and are warm and moiſt, and on the other ſide the North and Eaſt winds, have ſome affinity between them, being cold and dry.

11. The North and South winds (whereof we have alſo ſpoken before) do blow oftner than the Eaſt and Weſt winds, becauſe there is a great inequality of vapours in thoſe parts, by reaſon of the abſence and preſence of the Sun, but to the Eaſt and to the Weſt the Sun is as it were indifferent.

12. The ſouth wind is very healthful, when it comes from the Sea, but when it blows from the Continent it is more unhealthful; and ſo contrariwiſe the North wind is ſuſpicious, blowing from the Sea, from the Continent it is healthful. Likewiſe the ſouth ſea wind is very agreeable with Plants and Fruits, killing their Cankers, or ruſts and other hurtful annoiances.

13. A gentle ſouth wind doth aſſemble and gather together Clouds much, eſpecially if it continue but a ſhort while: but if it blow too boiſterouſly, or long, it clouds the skie, and brings in rain. But eſpecially when it ceaſes or grows remiſs, more than in its beginning, and when it is in its chiefeſt vigor.

14. When the ſouth wind either begins to blow, or ceaſes for the moſt there are changes of weather, from fair to cloudy, and from hot to cold, and contrariwiſe. The North wind many times riſes and ceaſes, the former weather remaining and continuing.

15. After hoary froſts and long continued ſnow, there ſcarcely blows any other wind than a ſouth wind, there being as it were a concoction, or digeſtion made of cold, which then at laſt diſſolves: neither doth rain alſo follow; but this likewiſe happens in changes, or intervals of fair weather.

16. The ſouth wind riſes oftner, and blows ſtronger in the night than in the day, eſpecially in winter nights. But the North wind if it riſe in the night (which is contrary to its cuſtom) it doth uſually laſt above three days.

17. When the ſouth wind blows the waves ſwell higher than when the north wind blows, though it blow with an equal or leſſer force.

18. The ſouth wind blowing, the ſea becomes blew, and more bright than when the North wind blows, which cauſes it to look darker and blacker.

19. When the air becomes warmer on a ſudden, it ſometimes betokens rain: and again at other times, when on a ſudden it grows, colder, it likewiſe betokens rain. But this happens according to the Nature of the winds: for if the air grow warm, whilſt the ſouth or eaſt wind blows, there is rain at hand; and likewiſe when it grows cold during the Northern or Weſtern blaſts.

20. The ſouth wind blows for the moſt part entire, and alone. But the north wind blowing, eſpecially the Eaſt North-Eaſt, or the North-Weſt often times contrary and various, or divers winds blow together, whereby they are broken and diſturbed.

21. Beware a Northern wind when you ſow ſeed, neither would I wiſh any one to inoculate or graft in a ſouuthern wind.

22. Leaves fall from trees ſooneſt on the ſouth ſide, but Vine ſprouts or ſtalks bud forth, and grow moſt that way.

23. In large Paſture ſhepheards muſt take care (as *Pliny* ſaith) to bring their Flocks to the North ſide, that they may feed againſt the South. For if they feed towards the North, they grow lame and bleereyed, and diſtempered in their bellies. The Northern wind alſo doth ſo weaken their coupling, that if they couple looking that way, they will for the moſt part bring forth Ewe-Lambs. But *Pliny* doth not ſtand very ſtifly to this Opinion, having as it were but taken it up upon truſt, and borrowed it.

24. Winds are hurtful to Wheat and all manner of grain at three times: namely, at the opening and at the falling of the flower, and when the grain it ſelf is ripe, for then they blow the Corn out of the Ear, and at the other two times either they blaſt the flower, or blow it off.

25. While the ſouth wind blows mens breath grow ranker, all creatures appetites decay, peſtilent diſeaſes reign, men wax more ſlow and dull. But when the wind is Northwardly, men are more lively, healthful, and greedy after food. Yet the Northern wind is hurtful for them that are troubled with the Phthiſick, Cough, Gout, or any other ſharp defluxions.

26. An Eaſt wind is dry, piercing, and mortifying. The Weſt wind moiſt, meek and nouriſhing.

27. If the Eaſt wind blow when the Spring is any thing forward, it is hurtful to fruits, bringing in of Worms and Caterpillars, ſo that the leaves are hardly ſpared: neither is it very good to grain. Contrariwiſe, the Weſt wind is very propitious and friendly to Herbs, Flowers, and all man-

ner of vegitables. And ſo is the Eaſt wind too about the Autumnal Equinoctial.

28. Weſtern winds are more vehement than Eaſtern winds, and bow and bend Trees more.

29. Rainy weather which begins when the Eaſt wind blows, doth laſt longer than that which begins when a Weſt wind blows, and may peradventure hold out for a whole day.

30. The Eaſt and North wind, when they once begin to blow, blow more conſtantly; the South and Weſt wind are more mutable.

31. In an Eaſtern wind all viſible things do appear bigger; But in a Weſtern wind all audible things are heard further, as ſounds of Bells, and the like.

32. The Eaſt, North-Eaſt wind draws Clouds to it. It is a Proverb amongſt the Greeks to compare it to Uſurers, who by laying out mony do ſwallow it up: It is a vehement and large wind, which cannot remove Clouds ſo faſt, as they will turn back and preſs upon it. Which is likewiſe ſeen in great fires, which grow ſtronger againſt the wind.

33. Cardinal or Semi-Cardinal winds are not ſo ſtormy as the Median.

34. Median winds from North to North-Eaſt are more fair, from North-Eaſt to Eaſt more ſtormy. Likewiſe from Eaſt to South-Eaſt more fair, from South-Eaſt to South more ſtormy. Likewiſe from South to South-Weſt more fair, from South-Weſt to Weſt more ſtormy. Likewiſe from Weſt to North-weſt more fair; from North-weſt to North more ſtormy. So that proceeding according to the order of the heavens, the Median winds of the firſt half-ward are always diſpoſed to fair weather; thoſe of the latter half-ward to ſtorms and tempeſts.

35. Thunders and Lightnings, and ſtorms, with falling of broken Clouds are, when cold winds as participate of the North do blow, as the North-weſt, North, North-weſt, North North-eaſt, North-eaſt, and Eaſt North-eaſt. Wherefore thoſe thunders likely are accompanied with Hail.

36. Likewiſe ſnowy winds come from the North, but it is from thoſe Median winds which are not ſtormy, as the North-weſt, and North-eaſt and by North.

37. Winds gain their Natures and Properties five wayes onely: Either by the abſence or preſence of the Sun; or by agreeing or diſagreeing with the natural Motion of the Air; or by the diverſity of the matter which feedeth them, by which they are engendred; as Sea, Snow, Mariſhes, or the like: Or by the tincture of the Countrys through which they paſs: Or by their original local beginnings: on high, under ground, in the middle; all which things the enſuing Articles will better declare and explain.

38. All winds have a power to dry, yea more than the Sun it ſelf, becauſe the Sun draws out the vapours; but if it be not very fervent, it doth not diſperſe them: but the wind both draws them out, and carries them away. But the ſouth wind doth this leaſt of any; and both timber and ſtones ſweat more when the South wind blows a little, than when it is calm and lies ſtil.

39. March winds are far more drying than ſummer winds: inſomuch that ſuch as make Muſical Inſtruments will ſtay for March winds to dry their ſtuff they make their Inſtruments of, to make it more porous, and better ſounding.

40. All manner of winds purge the air, and cleanſe it from all putrifaction, ſo that ſuch years as are moſt windy, are moſt healthful.

41. The Sun is like to Princes, who ſometimes having appointed Deputies in ſome remote Countries, the ſubjects there are more obſequious to thoſe Deputies, and yield them more reſpect than to the Prince himſelf. And ſo the winds which have their power and origine from the Sun, do govern the temperatures of the Countries, and the diſpoſition of the air as much or more than the Sun it ſelf. Inſomuch that *Peru* (which by reaſon of the nearneſs of the Ocean, the vaſtneſs of Rivers, and exceeding great and high hills, hath abundance of winds and blaſts blowing there) may contend with *Europe* for a temperate and ſweet air.

42. It is no wonder if the force and power of winds be ſo great, as it is found to be; Vehement winds being as Inundations, Torrents, and Flowings of the ſpacious air, Neither (if we attentively heed it) is their power any great matter. They can throw down trees, which with their tops, like unto ſpread ſails, give them advantage to do it, and are a burden to themſelves: Likewiſe they can blow down weak buildings; ſtrong and firm ones they cannot without Earthquakes join with them. Sometimes they will blow all the ſnow off the tops of hills, buryng the Valley that is below them with it; as it befel ***Soliman*** in the ***Sultanian*** fields. They will alſo ſometimes drive in waters, and cauſe great Inundations.

43. Sometimes winds will dry up Rivers, and leave the Channels bare. For if after a great drought a ſtrong wind blows with the Current for many days, ſo that it as it were ſweeps away the water of the River into the ſea, and keeps the Sea water from coming in, the River will dry up in many places where it doth not uſe to be ſo.

Monition. Turn the Poles, and withal turn the Obſervations as concerning the North and South. For the preſence and abſence of the Sun being the cauſe, it muſt vary according to the Poles. But this may be a conſtant thing, that there is more ſea towards the ſouth, and more land towards the North, which doth not a little help the winds.

Monition. Winds are made, or engendred a thouſand ways, as by the ſubſequent Inquiſition it will appear; ſo to fix that Obſervations in a thing ſo various is not very eaſie. Yet thoſe things which we have ſet down, are for the moſt part, moſt certain.

Local beginnings of Winds.

To the eighth Article.

Connexion.

TO know the local beginnings of winds, is a thing which requires a deep ſearch and Inquiſition, ſeeing that the *Whence* and *Whither* of winds, are things noted even in Scripture to be abſtruſe and hidden. Neither do we now ſpeak of the Fountains or beginnings of particular winds, (of which more ſhall be ſaid hereafter) but of the matrixes of winds in general. Some fetch them from above, ſome ſearch for them in the deep: but in the middle (where they are for the moſt part engendred) no body hardly looks for them: ſuch is the cuſtom of men to enquire after things which are obſcure, and omit thoſe things which lie, as it were, in their way. This is certain that winds are either in-bred, or ſtrangers. For winds are as it were Merchants of vapors, which being by them gathered into Clouds, they carry out, and bring in again into Countreys, from whence winds are again returned as it were by exchange. But let us now enquire concerning Native winds, for thoſe which coming from another place are ſtrangers, are in another place Natives. There are three local beginnings of them; They either breath or ſpring out of the ground, or are caſt down from above, or are here made up in the body of the Air. Thoſe which are caſt down from above, are of a double generation: for they are either caſt down before they be formed into Clouds, or afterwards compoſed of rarified and diſperſed Clouds. Let us now ſee what is the Hiſtory of theſe things.

1. The Poets feigned *Eolus* his Kingdom to be placed under ground in Dens and Caves, where the winds priſon was, out of which they were at times let forth.

2. Some Philoſophical Divines moved by thoſe words of Scripture, *He brings forth the winds out of his Treaſures*, think that the winds come out of ſome Treaſuries; namely, places under ground amongſt the Mines of Minerals. But this is nothing: for the Scripture ſpeaketh likewiſe of the Treaſures of Snow and Hail, which doubtleſs are engendred above.

3. Queſtionleſs in ſubterraneal places there is great ſtore of Air, which it is very likely ſometimes breaths out by little and little, and ſometimes again upon urgent cauſes, muſt needs come ruſhing forth together.

An Indirect Experiment.

In great droughts, and in the middle of Summer, when the ground is cleft and chopped, there breaks out water many times in dry and ſandy places. Which if waters (being a groſs body) do, though it be but ſeldom, it is probable that the air (which is a ſubtile and tenuous body) may often do it.

4. If the Air breaths out of the earth by little and little, and ſcatteringly, it is little perceived at the firſt; but when many of thoſe ſmall emanations or comings out are come together, there is a wind produced, as a River out of ſeveral Springs. And this ſeems to be ſo, becauſe it hath been obſerved by the Ancients, that many winds in thoſe places where they begin, do at firſt blow but ſoftly, which afterward grow ſtronger and increaſe in their progreſs like unto Rivers.

5. There are ſome places in the Sea, and ſome Lakes alſo which ſwell extreamly when there is no wind ſtirring; which apparently proceeds from ſome ſubterraneal wind.

6. There is great quantity of ſubterraneal ſpirit required to ſhake or cleave the earth; leſs will ſerve turn for the raiſing of water. Wherefore earthquakes come but ſeldom, riſings and ſwellings of waters are more frequent.

7. Likewiſe it is every where taken notice of that waters do ſomewhat ſwell and riſe before Tempeſts.

8. The weak ſubterraneal ſpirit which is breathed out ſcatteringly; is not perceived upon the earth, until it be gathered into wind, by reaſon the earth is full of pores; but when it iſſues from under the water, it is

preſently perceived (by reaſon of the waters continuity) by ſome manner ſwelling.

9. We reſolved before that in Cavernous and Denny places there were attendant winds; inſomuch that thoſe winds ſeem to have their local beginnings out of the earth.

10. In great and rocky Hills winds are found to breath ſooner, (namely before they be perceived in the Valleys) and more frequently, (namely when it is calm weather in the valleys,) But all mountains and rocks are cavernous and hollow.

11. In *Wales*, in the County of *Denbigh*, a mountainous and rocky Country, out of certain Caves (as *Gilbertus* relateth) are ſuch vehement eruptions of wind, that cloaths or linnen laid out there upon any occaſion, are blown up, and carried a great way up into the air.

12. In *Aber Barry* near *Severn* in *Wales* in a rocky cliff, are certain holes, to which if you lay your ear, you ſhall hear divers ſounds and murmurs of winds under ground.

An Indirect Experiment.

Acoſta hath obſerved that the Towns of *Plata* and *Potoſa*, in *Peru* are not far diſtant one from the other, and both ſituated upon a high and hilly ground, ſo that they differ not in that. And yet *Potoſa* hath a cold and winter-like air; and *Plata* hath a mild and ſpring-like temperature; which difference it ſeems may be attributed to the ſilver Mines which are near *Potoſa*: Which ſheweth that there are breathing places of the earth, as in relation to hot and cold.

13. If the earth be the firſt cold thing, according to *Parmenides*, (whoſe opinion is not contemptible, ſeeing cold and denſity are knit together by a ſtrict knot) it is no leſs probable that there are hotter breaths ſent out from the Central cold of the earth, than are caſt down from the cold of the higher air.

14. There are certain Wells in *Dalmatia*, and the Country of *Cyrene* (as ſome of the Ancients record) into which if you caſt a ſtone, there will preſently ariſe tempeſts, as if the ſtone had broken ſome covering of a place, in which the force of the winds was incloſed.

An Indirect Experiment.

Ætna, and divers other Mountains caſt out fire: therefore it is likely that air may likewiſe break forth, eſpecially being dilatated and ſet into motion, by heat in ſubterraneal places.

15. It hath been noted, that both before and after Earth-quakes, there hath blown certain noxious and forraign winds: as there are certain little ſmothers uſually before and after great firings and burnings.

Monition. The Air ſhut up in the earth is forced to break out for ſeveral cauſes, ſometimes a maſs of earth, ill joined together, falls into a hollow place of the earth; ſometimes waters do ingulf themſelves; ſometimes the Air is extended by ſubterraneal heats, and ſeeks for more room: ſometimes the earth which before was ſolid and vaulted, being by fires turned into aſhes, no longer able to bear it ſelf up, falls. And many ſuch like cauſes.

And ſo theſe Inquiſitions have been made concerning the firſt local beginning of winds. Now followeth the ſecond origine, or beginning from above, namely from that which they call the middle Region of the air.

Monition. But let no man underſtand what hath been ſpoken, ſo far amiſs; as if we ſhould deny the reſt of the winds alſo are brought forth of the earth by vapours. But this firſt kind was of winds which come forth of the earth, being already perfectly framed winds.

16. It hath been obſerved, that there is a murmuring of woods before we do plainly perceive the winds, whereby it is conjectured, that the wind deſcends from a higher place: which is likewiſe obſerved in Hills, (as we ſaid before) but the cauſe is more ambiguous, by reaſon of the concavity and hollowneſs of the hills.

17. Wind follows darted, or (as we call them) ſhooting ſtars, and it come that way as the ſtar hath ſhot; whereby it appears, that the air hath been moved above, before the motion comes to us.

18. The opening of the Firmament, and diſperſion of Clouds, are Prognoſticks of winds, before they blow here on earth, which alſo ſhews that the winds begin above.

19. Small ſtars are not ſeen before the riſing of winds, though the night be clear and fair. Becauſe (it ſhould ſeem) the Air grows thick, and is leſs tranſparent, by reaſon of that matter which afterward is turned into wind.

20. There appears Circles about the body of the Moon, the Sun looks ſometimes blood red at its ſetting, the Moon riſes red at her fourth riſing; and there are many more Prognoſticks of winds on high (whereof we will ſpeak in its proper place) which ſhews that the matter of the winds is there begun and prepared.

21. In theſe Experiments you muſt note, that difference we ſpake of; namely of the two-fold generation of winds on high: that is to ſay, before the gathering together of vapours into a Cloud, and after. For the Prognoſticks of Circles about, and colours of the Sun and Moon, have ſomething of the Cloud: but that darting, and occultation of the leſſer ſtars, is in fair and clear weather.

22. When the wind comes out of a Cloud ready formed, either the Cloud is totally diſperſed, and turned into wind; or it is torn and rent in ſunder, and the wind breaks out, as in a ſtorm.

23. There are many Indirect Experiments in the world, concerning the repercuſſion by cold. So that it being certain, that there are moſt extream colds in the middle region of the Air: it is likewiſe plain, that vapours for the moſt part cannot break through that place without being joined and gathered together, or darted according to the opinion of the Ancients, which in this particular is true and ſound.

The third local beginning of winds, is of thoſe which are ingendred here in the lower part of the air, which we alſo call ſwellings or overburthenings of the Air. A thing very familiar and frequent, yet paſſed over with ſilence.

A *Commentation.* The generation of thoſe winds which are made up in this lower part of the Air, is a thing no more obſcure than this: namely, that the Air newly compoſed and made up of water, and attenuated and reſolved vapours, joined with the firſt Air, cannot be contained within the ſame bounds as it was before, but groweth out and is turned, and takes up further room. Yet there are in this two things to be granted.

Firſt,

Firſt, that one drop of water turned into air (whatſoever they fabulouſly ſpeak of the tenth proportion of the Elements) requires, at leaſt a hundred times more room than it had before. Secondly, that a little new air, and moved, added to the old air, ſhaketh the whole, and ſets it into motion: as we may perceive by a little wind that comes forth of a pair of Bellows, or in at a little crevice of a window or wall; that will ſet all the air which is in a room in motion, as appears by the blazing of the lights which are in the ſame room.

24. As Dews and Miſts are ingendred here in the lower air, never coming to be Clouds, nor penetrating to the middle region of the Air: in the like manner are alſo many winds.

25. A continual gale blows about the ſea, and other waters, which is nothing but a ſmall wind newly made up.

26. The Rain-bow, which is as it were the loweſt of Meteors, and neareſt to us, when it doth not appear whole, but curtailed, and as it were only ſome pieces of the horns of it, is diſſolved into winds, as often, or rather oftner than into rain.

27. It hath been obſerved, that there are ſome winds in Countrys which are divided and ſeparated by hills; which ordinarily blow on the one ſide of the hills, and do not reach to the other. Whereby it manifeſtly appears that they are engendred below the height of the ſaid hills.

28. There are an infinite ſort of winds that blow in fair and clear days; and alſo in Countrys where it never rains; which are ingendred where they blow, and never were Clouds, nor did ever aſcend into the middle region of the air.

Indirect Experiments.

Whoſoever ſhall know how eaſily a Vapour is diſſolved into air, and how great a quantity of vapours there are; and how much room a drop of water turned into air takes up more than it did before (as we ſaid already) and how little the air will endure to be thruſt up together, will queſtionleſs affirm, that of neceſſity winds muſt be every where ingendred, from the very ſuperficies of the earth, even to the higheſt parts of the air. For it cannot be, that a great abundance of vapours, when they begin to be dilatated and expanded, can be lifted up to the middle region of the air, without an over-burthening of the air, and making a noiſe by the way.

Accidental generations of Winds.

To the Ninth Article.

Connexion.

WE call thoſe Accidental generations of winds, which do not make or beget the impulſive motion of winds, but with compreſſion do ſharpen it, by repercuſſion turn it, by ſinuation or winding do agitate and tumble it: which is done by extrinſecal cauſes, and the poſture of the adjoining bodies.

1. In places where there are hills which are not very high, bordering upon Valleys, and beyond them again higher hills, there is a greater agitation of the air, and ſenſe of winds, than there is in mountainous, or plain places.

2. In Cities, if there be any place ſomewhat broader than ordinary and narrow goings out, as Portals, or Porches, and Croſs ſtreets, winds and freſh Gales are there to be perceived.

3. In houſes cool rooms are made by winds, or happen to be ſo, where the Air bloweth thorow, and comes in on the one ſide, and goeth out at the other: But much more if the Air comes in ſeveral ways and meets in the corners, and hath one common paſſage from thence: the vaulting likewiſe and roundneſs doth contribute much to coolneſs, becauſe the air being moved, is beaten back in every line, Alſo the winding of Porches is better than if they were built ſtraight out. For a direct blaſt, though it be not ſhut up, but hath a free egreſs, doth not make the air ſo unequal, and voluminous, and waving, as the meeting at Angles, and hollow places, and windings round, and the like.

4. After great tempeſts at Sea, an Accidental wind continues for a time, after the original is laid; which wind is made by the colliſion and percuſſion of the air, through the curling of the waves.

5. In gardens commonly there is a repercuſſion of wind, from the walls, and banks, ſo that one would imagine the wind to come the contrary way from that whence it really comes.

6. If Hills encloſe a Country on the one ſide, and the wind blows for ſome ſpace of time from the plain againſt the Hill, by the very repercuſſion of the Hill, either the wind is turned into rain, if it be a moiſt wind, or into a contrary wind, which will laſt but a little while.

7. In the turnings of Promontory, Mariners do often find changes and alterations of winds.

Extraordinary Winds, and ſudden Blaſts.

To the tenth Article.

Connexion.

SOme men diſcourſe of extraordinary winds, and derive the cauſes of them; of Clouds breaking, or ſtorms, *Vortice*, *Typhone*, *Preſtere*; Or in Engliſh, Whirl-winds. But they do not relate the thing it ſelf, which muſt be taken out of Chronicles and ſeveral Hiſtories.

1. Sudden blaſts never come in clear weather, but always when the sky is cloudy, and the weather rainy. That it may juſtly be thought that there is a certain eruption made; The blaſt driven out, and the waters ſhaken.

2. Storms which come with a Miſt and a Fog, and are called *Belluæ*, and bear up themſelves like a Column, are very vehement, and dreadful to thoſe who are at ſea.

3. The greater *Typhones*, who will take up at ſome large diſtance, and ſup them, as it were upward, do happen but ſeldom, but ſmall whirlwinds come often.

4. All ſtorms and *Typhones*, and great Whirlwinds, have a manifeſt precipitous motion, or darting downwards, more than other winds; ſo

as they ſeem to fall like Torrents, and run as it were in Channels, and be afterward reverberated by the earth.

5. In Meadows, Haycocks, are ſometimes carryed on high; and ſpread abroad there like Canopies: Likewiſe in Fields, Cocks of Peaſe, reaped Wheat, and cloaths laid out to drying, are carried up by Whirl-winds as high as tops of Trees and Houſes, and theſe things are done without any extraordinary force, or great vehemency of wind.

6. Alſo ſometimes there are very ſmall whirl-winds, and within a narrow compaſs, which happen alſo in fair clear weather; ſo that one that rides may ſee the duſt, or ſtraws taken up, and turned cloſe by him, yet he himſelf not feel the wind much; which things are done queſtionleſs near unto us, by contrary blaſts driving one another back, and cauſing a circulation of the air by concuſſion.

7. It is certain, that ſome winds do leave manifeſt ſigns of burning and ſcortching in Plants. But *Preſterem*, which is a kind of dark Lightning, and hot air without any flame, we will put off to the Inquiſition of Lightning.

Helps to Winds; namely, to Original Winds: for of accidental ones we have enquired before.

To the 11, 12, 13, 14, 15 *Articles.*

Connexion.

THoſe things which have been ſpoken by the Ancients, concerning Winds and their cauſes, are meerly confuſed and uncertain, and for the moſt part untrue: and it is no marvel, if they ſee not clear that look not near. They ſpeak as if wind were ſomewhat elſe, or a thing ſeveral from moved air; and as if exhalations did generate and make up the whole body of the winds; and as if the matter of winds were only a dry and hot exhalation; and as if the beginning of the motion of winds were but only a caſting down and percuſſion by the cold of the middle Region, all fantaſtical and arbitrary opinions: yet out of ſuch threds they weave long pieces, namely, Cobwebs. But all impulſion of the Air is wind; and Exhalations mixed with the air contribute more to the motion than to the matter: and moiſt vapours, by a proportionate heat, are eaſilier diſſolved into wind than dry Exhalations, and many winds are engendred in the loweſt Region of the Air, and breath out of the earth, beſides thoſe which are thrown down and beaten back.

1. The Natural wheeling of the air (as we ſaid in the *Article of General Winds*) without any other external cauſe bringeth forth winds preceptible within the Tropicks, where the Converſion is ingreater Circles.

2. Next to the Natural Motion of the Air, before we enquire of the Sun (who is the chief begetter of winds) let us ſee whether any thing ought to be attributed to the Moon, and other Aſters by clear experience.

3. There ariſe many great and ſtrong winds ſome hours before the Eclipſe of the Moon; ſo that if the Moon be Eclipſed in the middle of the night, the winds blow the precedent evening: if the Moon be Eclipſed towards the morning, then the winds blow in the middle of the precedent night.

4. In *Peru*, which is a very windy Country, *Acoſta* obſerves that winds blow moſt when the Moon is at the full.

Injunction. It were certainly a thing worthy to be obſerved, what power the Ages and Motions of the Moon have upon the winds, ſeeing they have ſome power over the waters. As for example, whether the winds be not in a greater commotion in full and new Moons, than in her firſt and laſt Quarters, as we find it to be in the flowings of waters: For though ſome do conveniently feign the command of the Moon to be over the waters, as the Sun and Planets over the air, yet it is certain, that the water and the air are very Homogeneal bodies; and that the Moon next to the Sun hath moſt power over all things here below.

5. It hath been obſerved by men, that about the Conjunctions of Planets greater winds do blow.

6. At the riſing of *Orion* there riſe commonly divers winds and ſtorms. But we muſt adviſe whether this be not becauſe *Orion* riſes in ſuch a ſeaſon of the year as is moſt effectual for the generation of winds; ſo that it is rather a concomitant than cauſing thing. Which may alſo very well be queſtioned concerning rain at the riſing of the *Hyades* and the *Pleiades*, and concerning ſtorms at the riſing of *Arcturus*. And ſo much concerning the Moon and Stars.

7. The Sun is queſtionleſs the primary efficient of many winds, working by its heat on a twofold matter, namely, the body of the air, and likewiſe vapours and exhalations.

8. When the Sun is moſt powerful, dilatates and extends the air, though it be pure and without any commixion one third part, which is no ſmall matter; ſo that by meer dilatation there muſt needs ariſe ſome ſmall wind in the Suns ways; and that rather two or three hours after its riſing, than at his firſt riſe.

9. In *Europe* the nights are hotter, in *Peru* three hours in the morning, and all for one cauſe, namely, by reaſon of winds and gales ceaſing and lying ſtill at thoſe hours.

10. In a *Vitro Calendari*, dilatated or extended air beats down the water as it were with a breath: but in a *Vitro Pileato*, which is filled only with air, the dilatated air ſwells the Bladder, as a manifeſt and apparent wind.

11. We have made trial of ſuch a kind of wind in a round Tower, every way cloſed up. For we have placed a hearth or fire-place in the middeſt of it, laying a fire of Charcoal throughly kindled upon it, that there might be the leſs ſmoak, and on the ſide of the hearth, at a ſmall diſtance, hath been a thread hung up with a croſs of Feathers, to the end that it might eaſily be moved. So after a little ſtay the heat increaſing, and the Air dilatating, the thread and the Feather croſs which hung upon it waved up and down in a various motion: and having made a hole in the window of the Tower, there came out a hot breath, which was not continual, but with intermiſſion and waving.

12. Alſo the reception of Air by cold, after dilatation begets ſuch a wind, but weaker, by reaſon of the leſſer force of cold. So that in *Peru* under every little ſhadow we find not only more coolneſs than here with us (by Antiperiſtaſis) but a manifeſt kind of gale through the reception of air when it comes into the ſhade. And ſo much concerning wind occaſioned by meer dilatation or reception of Air.

13. Winds proceeding from the meer motion of the air without any commixion of vapours, are but gentle and ſoft. Let us ſee what may be ſaid concerning Vaporary winds,(we mean ſuch as are engendred by vapours) which may be ſo much more vehement than the other, as a dilatation of a drop of water turned into air, exceeds any dilatation of Air already made: which it doth by many degrees, as we ſhewed before.

14. The efficient cauſe of vapourary winds, (which are they that commonly blow) is the Sun, and its proportionate heat: the matter is Vapors and Exhalations which are turned and reſolved into Air. I ſay Air (and not any thing but Air) yet at the firſt not very pure.

15. A ſmall heat of the Sun doth not raiſe Vapours, and conſequently cauſes no wind.

16. A mean, or middle heat of the Sun raiſeth and excites vapours, but doth not preſently diſſipate them. Therefore if there be any great ſtore of them, they gather together into rain, either ſimply of it ſelf, or joined with wind: if there be but ſmall ſtore of them, they turn only to wind.

17. The Suns heat in its increaſe, inclines more to the generation of winds, in its decreaſe of rains.

18. The great and continued heat of the Sun, attenuates and diſperſes vapours and ſublimes them, and withal equally mixes and incorporates them with the Air, wherby the Air becomes calm and ſerene.

19. The more equal and continuate heat of the Sun is leſs apt for the generation of winds: that which is more unequal and intermitted, is more apt. Wherefore in ſailing into *Ruſſia* they are leſs troubled with winds than in the Brittiſh Sea, becauſe of the length of the days: but in *Peru* under the Equinoctial are frequent winds, by reaſon of the great inequality of heat, taking turns night and day.

20. In Vapours is to be conſidered both the quantity and quality. A ſmall quantity engenders weak winds, a mean or middle ſtore ſtronger; great ſtore engenders rain, either calm, or accompanied with wind.

21. Vapours out of the Sea and Rivers, and over-flown Mariſhes, engender far greater quantity of winds than the exhalations of the earth. But thoſe winds which are engendred on the land, and dry places are more obſtinate and laſt longer, and are for the moſt part ſuch as are caſt down from above. So that the opinion of the Ancients in this is not altogether unprofitable: but only that it pleaſed them, as in a manner dividing the inheritance, to aſſign rain to Vapours, and to winds, exhalations only, which things ſound handſomly, but are vain in effect and ſubſtance.

22. Winds brought forth out of the reſolutions of Snow lying upon Hills, are of a mean condition between Water and Land winds; but they incline more to water; yet they are more ſharp and moveable.

23. The diſſolution of Snow on Snowy Hills, (as we obſerved before) always brings conſtant winds from that part.

24. Alſo yearly Northern winds about the riſing of the Dog-ſtar, are held to come from the frozen Ocean, and thoſe parts about the Artick Circle, where the Diſſolutions of Snow and Ice come late when the Summer is far ſpent.

25. Thoſe maſſes or mountains of Ice which are carried towards *Canada* and *Greenland*, do rather breed cold Gales, than moveable winds.

26. Winds which ariſe from chalky and ſandy grounds are few and dry, and in hotter Countrys they are ſoultry, ſmoaky, and ſcorching.

27. Winds made of Sea vapours, do eaſilier turn back into rain, the water re-demanding and claiming its right: and if this be not granted them, they preſently mix with Air, and ſo are quiet. But terreſtrial, ſmoaky and unctuous vapours, are both hardlier diſſolved, and aſcend higher, and are more provoked in their motion, and oftentimes penetrate the middle Region of the Air, and ſome of them are matter of fiery Meteors.

28. It is reported here in *England*, that in thoſe days that *Gaſcoine* was under our juriſdiction, there was a Petition offered to the King by his ſubjects of *Burdeaux*, and the Confines thereof, deſiring him to forbid the burning of heath in the Counties of *Suſſex* and *Southampton*, which bred a wind towards the end of *April* which killed their Vines.

29. The meeting of winds, if they be ſtrong, bring forth vehement and whirling winds: if they be ſoft and moiſt, they produce rain, and lay the wind.

30. Winds are allayed and reſtrained five ways. When the Air overburthened, and troubled, is freed by the vapours contracting themſelves into rain: Or when vapours are diſperſed, and ſubtilized, whereby they are mixed with the air, and agree fairly with it, and they live quietly: Or when vapours or Fogs are exalted and carried upon high, ſo that they cauſe no diſturbance, until they be thrown down from the middle Region of the Air, or do penetrate it. Or when vapours gathered into Clouds, are carried away into other Countrys, by other winds blowing on high; ſo that for them there is peace in thoſe Countrys which they flie beyond: Or laſtly, when the winds blowing from their nurſeries, languiſh through a long voyage, finding no new matter to feed on, and ſo their vehemency forſakes them, and they do as it were expire and dye.

31. Rain for the moſt part allayeth winds, eſpecially thoſe which are ſtormy: as winds contrariwiſe oftentimes keep off rain.

32. Winds do contract themſelves into rain, (which is the firſt of the five, and the chiefeſt means of allaying them) either being burthened by the burthen it ſelf, when the vapours are copious, or by the contrary motions of winds, ſo they be calm and mild; or by the oppoſition of mountains and Promontories which ſtop the violence of the winds, and by little and little turn them againſt themſelves; or by extream colds, whereby they are condenſed and thickned.

33. Smaller and lighter winds do commonly riſe in the morning, and go down with the Sun, the condenſation of the night Air being ſufficient to receive them: for Air will endure ſome kind of compreſſion without ſtirring or tumult.

34. It is thought that the ſound of Bells will diſperſe Lightning and Thunder: in winds it hath not been obſerved.

Monition. Take advice from the place in Prognoſticks of winds; for there is ſome connexion of cauſes and ſigns.

35. *Pliny* relates, that the vehemence of a Whirl-wind may be allayed by ſprinkling of Vinegar in the encounter of it.

The Bounds of VVinds.

To the 16, 17, 18. *Articles.*

1. IT is reported of Mount *Athos*,& likewiſe of *Olimpus*,that the Prieſts would write in the aſhes of the Sacrifices which lay upon the Altars, built on the tops of thoſe hills, and when they returned the year following,(for the Offerings were Annual) they found the ſame letters undiſturbed,and uncancelled; though thoſe Altars ſtood not in any Temple, but in the open Air. Whereby it was manifeſt, that in ſuch a height there had neither fallen rain, nor wind blown.

2. They ſay that on the top of the Peak of *Teneriff*, and on the *Audes*, betwixt *Peru*, and *Chile*, ſnow lyeth upon the borders, and ſides of the hills; but that on the tops of them there is nothing but a quiet and ſtill Air, hardly breathable by reaſon of its tenuity, which alſo with a kind of Acrimony pricks the eyes and orifice of the ſtomack, begetting in ſome a deſire to vomit, and in others a fluſhing and redneſs.

3. Vaporary winds ſeem not in any great height, though it be probable that ſome of them aſcend higher than moſt clouds. Hitherto of the height, now we muſt conſider of the Latitude.

4. It is certain, that thoſe ſpaces which winds take up, are very various, ſometimes they are very large, ſometimes little and narrow: winds have been known to have taken up an hnndred miles ſpace with a few hours difference.

5. Spacious winds(if they be of the free kind) are for the moſt part vehement and not ſoft, and more laſting; for they will laſt almoſt four and twenty hours. They are likewiſe not ſo much inclined to rain. Straight or narrow winds contrariwiſe, are either ſoft or ſtormy, and always ſhort.

6. Fixed and ſtayed winds are itinerary or travelling, and take up very large ſpaces.

7. Stormy winds do not extend themſelves into any large ſpaces, though they always go beyond the bounds of the ſtorm it ſelf.

8. Sea winds always blow within narrower ſpaces than earth winds, as may ſometimes be ſeen at ſea, namely, a pretty freſh gale in ſome part of the water (which may be eaſily perceived by the criſping of it) when there is a calm, as ſmooth as Glaſs, every where elſe.

9. Small whirlwinds (as we ſaid before) will ſometimes play before men as they are riding, almoſt like wind out of a pair of bellows. So much of the Latitude; now we muſt ſee concerning the laſtingneſs.

10. The vehement winds will laſt longer at Sea, by reaſon of the ſufficient quantity of vapours: at land they will hardly laſt above a day and an half.

11. Very ſoft winds will not blow conſtantly, neither at ſea,nor upon the land above three days.

12. The ſouth wind is not only more laſting than the weſt, (which we ſet down in another place) but likewiſe what wind ſoever it be that begins to blow in the morning, uſeth to be more durable and laſting than that which begins to blow at night.

13. It is certain that winds do riſe, and increaſe by degrees, (unleſs they be meer ſtorms) but they allay ſooner, ſometimes as it were in an inſtant.

Succeſ-

Succeſſions of Winds.

To the 19, 20, 21 *Articles.*

1. IF the Wind doth change according to the motion of the Sun, that is from Eaſt to South, from South to Weſt, from Weſt to North, from the North to the Eaſt, it doth not return often, or if it doth, it doth it but for a ſhort time. But if it go contrary to the motion of the Sun, that is from the Eaſt to the North, from the North to the Weſt, from the Weſt to the South, and from the South to the Eaſt, for the moſt part it is reſtored to its firſt quarter, at leaſt before it hath gone round its whole compaſs and circuit.

2. If rain begin firſt, and the wind begins to blow afterwards, that wind will outlaſt the rain: but if the wind blow firſt, and then is allayed by the rain, the wind for the moſt part will not riſe again; and if it does, there enſues a new rain.

3. If winds do blow variouſly for a few hours, and as it were to make a trial, and afterward begin to blow conſtantly; that wind ſhall continue for many days.

4. If the South wind begin to blow two or three days, ſometimes the North wind will blow preſently after it. But if the North wind blows as many days, the ſouth wind will not blow, until the wind have blown a little from the Eaſt.

5. When the year is declining, and Winter begins after Autumn is paſt, if the Southwind blows in the beginning of winter, and after it comes the North-wind, it will be a froſty winter: But if the North-wind blow in the beginning of winter, and the South-wind come after, it will be a mild and warm winter.

6. ***Pliny*** quotes ***Eudoxus***, to ſhew that the order of winds returns after every four years, which ſeems not to be true, for revolutions are not ſo quick. This indeed hath been by ſome mens diligence obſerved, that greateſt and moſt notable ſeaſons (for heat, ſnow, froſt, warm winters, and cold ſummers) for the moſt part return after the revolution of five and thirty years.

The Motion of the Winds.

To the 22, 23, 24, 25, 26, 27 *Articles.*

Connexion.

MEn talk as if the wind were ſome body of it ſelf, and by its own force did drive and agitate the air. Alſo when the wind changes its place, they talk as if it did tranſport it ſelf into another place. This is the vulgars opinion; yet the Philoſophers themſelves apply no remedy thereunto, but they likewiſe ſtammer at it, and do not any way contradict and oppoſe theſe errors.

1. We muſt therefore enquire concerning the raiſing of the motion of the winds, and of the Direction of it, having already enquired of the local beginnings. And of thoſe winds which have their beginning of motion in their firſt impulſion, as in thoſe which are caſt down from above, or blow out of the earth, the raiſing of their motion is manifeſt: others deſcend below their own beginnings; others aſcend, and being reſiſted by

the Air, become voluminous,eſpecially near the Angles of their violence. But of thoſe which are engendred every where in this inferiour Air, (which are the frequenteſt of all the winds) the Inquiſition ſeems to be ſomewhat obſcure, although it be a vulgar thing, as we have ſet down in the Commentation under the eighth Article.

2. We found likewiſe an image or repreſentation of this in that cloſe Tower which we ſpake of before. For we varied that trial three ways. The firſt was that which we ſpake of before; namely, a fire of clear burning coals. The ſecond was a Kettle of ſeething water, the fire being ſet away, and then the motion of the croſs of Feathers was more ſlow and dull. The third was with both fire and Kettle: and then the agitation of the Croſs of Feathers was very vehement, ſo that ſometimes it would whirle up and down,as if it had been in a petty whirlwind,the water yielding ſtore of vapours, and the fire which ſtood by it diſſipating and diſperſing them.

3. So that the chief cauſe of exciting motion in the winds is the overcharging of the air,by a new addition of air engendred by vapours. Now we muſt ſee concerning the direction of the motion, and of the whirling, which is a chang of the direction.

4. The Nurſeries and food of the winds doth govern their progreſſive motion: which nurſeries and feedings are like unto the ſprings of rivers; namely, the places where there are great ſtore of vapours, for there is the native Country of the winds. Then when they have found a Current, where the air makes no reſiſtance, (as water when it finds a falling way) then whatſoever ſemblable matter they find by the way, they take into their fellowſhip,and mix it with their Currents even as Rivers do. So that the winds blow always from that ſide where their Nurſeries are which feed them.

5. Where there are no notable Nurſeries in any certain place, the winds ſtray very much,and do eaſily change their Current,as in the middle of the ſea,and large ſpacious fields.

6. Where there are great nurſeries of the winds in one place, but in the way of its progreſs it hath but ſmall additions, there the winds blow ſtrongly in their beginnings,and by little and little they allay. And contrariwiſe, where they find good ſtore of matter to feed on by the way, they are weak in the beginning,but gather ſtrength by the way.

7. There are moveable nurſeries for the winds,namely, in the Clouds, which many times are carried far away from the Nurſeries of vapours, of which thoſe Clouds were made,by winds blowing high: then the Nurſery of the wind begins to be in that place where the Clouds do begin to be diſſolved into wind.

8. But the whirling of winds does not happen,becauſe the wind which blows at firſt tranſports it ſelf; but becauſe either that is allayed and ſpent, or brought into order by another wind: And all this buſineſs depends on the various placings of the Nurſeries of winds, and variety of times, when vapours iſſuing out of theſe Nurſeries are diſſolved.

9. If there be Nurſeries of winds on contrary parts, as one Nurſery on the South, another on the North-ſide, the ſtrongeſt wind will prevail; neither will there be contrary winds, but the ſtronger wind will blow continually, though it be ſomewhat dulled and tamed by the weaker wind: as it is in Rivers, when the flowing of the ſea comes in; for the Sea's motion prevails, and is the only one, but it is ſomewhat curbed by

the motion of the river. And if it ſo happen, that one of thoſe contrary winds, namely, that which was the ſtrongeſt be allayed, then preſently the contrary will blow, from that ſide where it blew before, but lay hidden under the force and power of the greater.

10. As for example, if the Nurſery be at the North-Eaſt, the North-Eaſt wind will blow. But if there be two Nurſeries of winds, namely, another in the North, thoſe winds for ſome tract of way will blow ſeverally; but after the angle of confluence where they come together, they will blow to the North-Eaſt, or with ſome inclination, according as the other Nurſery ſhall prove ſtronger.

11. If there be a Nurſery of wind on the North-ſide, which may be diſtant from ſome Country twenty miles, and is the ſtronger; another on the Eaſt-ſide, which is diſtant ſome ten miles, and is weaker: Yet the Eaſt-wind ſhall blow for ſome hours, and a while after (namely, when its journy is ended) the North wind.

12. If the Northern wind blow, and ſome Hill ſtands in the way of it on the Weſt ſide, a little while after the North-Eaſt wind will blow, compounded by the original, and that which is beaten back again.

13. If there be a Nurſery of winds in the earth on the Northern ſide, and the breath thereof be carried directly upward, and it find a cold Cloud on the Weſt ſide which turns it off the contrary way, there will blow a North-Eaſt wind.

14. ***Monition.*** Nurſeries of winds in Sea and Land are conſtant, ſo that the ſpring and beginning of them may be the better perceived: But the Nurſeries of winds in the Clouds are moveable, ſo that in one place there is matter furniſhed for the winds, and they are formed in another: which makes the direction of motion in winds, to be more confuſed and uncertain.

Thoſe things we have produced for examples ſake, the like are after the like manner: And hitherto of the direction of the motion of winds: Now we muſt ſee concerning the Longitude, and as it were the Itinerary or journy of the winds, though it may ſeem we have already enquired of this under the notion of the Latitude of winds: For Latitude may by unlearned men alſo be taken for Longitude, if winds take up more ſpace Laterally than they go forward in Longitude.

14. If it be true that *Columbus* could upon the Coaſts of *Portugal*, judge of the Continent of *America* by the conſtant winds from the Weſt, truly the winds can travel a long journy.

15. If it be true that the diſſolution of Snows about the frozen ſeas and *Scandia*, do excite and raiſe Northerly winds in *Italy*, and *Greece*, &c. in the Dog days; ſurely theſe are long journeys.

16. It hath not yet been obſerved how much ſooner a ſtorm does arrive, according to the way it comes, (as for example, if it be an Eaſtern wind) how much ſooner it comes from the Eaſt, and how much later from the Weſt. And ſo much concerning the motion of winds in their progreſſion or going forward: now we muſt ſee concerning the Undulation or ſwelling of winds.

17. The Undulation or ſwelling of winds is done in a few moments: So that a wind will (though it be ſtrong) riſe and fall by turns, at the leaſt a hundred times in an hour. Whereby it appears that the violence of winds is unequal; for neither Rivers, though ſwift, nor Currents in the Sea, though ſtrong, do riſe in waves, unleſs the blowing of wind be joined

ed thereunto: Neither hath the ſwelling of winds any equality in it ſelf. For like unto the pulſe of ones hand, ſometimes it beats, and ſometimes it intermits.

The Undulation or ſwelling of the air, differs from the ſwelling of waters into waves in this, that in waters after the waves are riſen on high, they of themſelves, and their own accord, do again fall to the place of them; whence it comes that (whatſoever Poets ſay when they aggravate tempeſts, namely, that the waves are raiſed up to heaven, and again ſink down to hell) the deſcent of the waves do not precipitate much below the plane and ſuperficies of the water. But in the ſwelling of the air, where the motion of gravity or weight is wanting, the air is thruſt down and raiſed almoſt in an equal manner. And thus much of Undulation; Now we muſt enquire of the motion of Conflict or Striving.

19. The Conflicts of winds, and compounded Conflicts we have partly enquired already. It is plain that winds are Ubiquitary, eſpecially the mildeſt of them. Which is likewiſe manifeſt by this, that there are few days and hours wherein ſome gales do not blow in free places, and that inconſtantly and variouſly enough. For winds which do not proceed from greater Nurſeries are vagabond and voluble, as it were playing one with the other; ſometimes driving forward, and ſometimes flying back.

20. It hath been ſeen ſometimes at Sea, that winds have come from contrary parts together, which was plainly to be perceived by the perturbation of the water on both ſides, and the calmneſs in the middle between them: but after thoſe contrary winds have met, either there hath followed a general calm of the water every where, namely, when the winds have broken and quelled one another equally; or the perturbation of the water hath continued, namely, when the ſtronger Wind hath prevailed.

21. It is certain, that in the mountains of *Peru* it hath often chanced that the winds at one time have blown on the tops of the Hills one way, and in the Valleys the clean contrary way.

22. It is likewiſe certain here with us, that the Clouds are carried one way, when the wind near us hath blown the contrary way.

23. That is likewiſe certain, that ſometimes the higher Clouds will out-flie the lower Clouds, ſo that they will go diverſe, yea, and contrary ways, as it were in contrary Currents.

24. It is likewiſe certain, that ſometimes in the higher part of the air winds have been neither diſtracted, nor moved forward; when here below they have been driven forward with a mad kind of violence, for the ſpace of half a mile.

25. And it is likewiſe certain, that contrariwiſe, that here below the air hath been very ſtill, when above the Clouds have been carried with a freſh and merry gale: But that happens more ſeldom.

An Indirect Experiment.

Likewiſe in waves ſometimes the upper water is ſwifter, ſometimes the lower; and ſometimes there are (but that is ſeldom) ſeveral Currents of water, of that which is uppermoſt, and that which lyeth beneath.

26. Nor are *Virgils* teſtimonies altogether to be rejected, he being not utterly unskilful in Natural Philoſophy.

Together ruſh the Eaſt and South-Eaſt wind,
Nor doth wave calling South-Weſt ſtay behind.

And again,
I all the winds have ſeen their battels join.

We have conſidered of the Motions of winds, in the nature of things: we muſt now conſider their Motions in humane Engines; and firſt of all in the Sails of Ships.

The Motion of Winds in the Sails of Ships.

1. IN our greateſt *Brittain* Ships (for we have choſen thoſe for our pattern) there are four Maſts, and ſometimes five, ſet up one behind the other, in a direct line drawn through the middle of the ſhip. Which Maſts we will name thus;

2. The main Maſt, which ſtands in the middle of the ſhip: the fore-Maſt, the Mizon-Maſt, (which is ſometimes double) and the Sprit Maſt.

3. Each Maſt conſiſts of ſeveral pieces, which may be lifted up, and faſhioned with ſeveral knots and joints, or taken away; ſome have three of them, ſome only two.

4. The Sprit-ſail Maſt from the lower joint lies bending over the Sea, from that it ſtands upright; all the other Maſts ſtand upright.

5. Upon theſe Maſts hang ten Sails, and when there be two Mizon-Maſts twelve: the Main-Maſt and fore-Maſt have three tires of ſails, which we will call the Main-ſail, the top ſail, and the Main top ſail: The reſt have but two, wanting the main top ſail.

6. The ſails are ſtretched out a croſs, near the top of every joint of the Maſt, by certain beams which we call Yards, to which the upper parts of the ſails are faſtened, the lower parts are faſtened with Ropes at each corner; the main ſails to the ſides of the ſhip, top and main top ſails to the Yards which are next below them.

7. The Yard of every Maſt hangs a croſs, only the Yards of the Mizon-Maſts hang ſloping, one end up and the other down, in the reſt they hang ſtraight a-croſs the Maſts like unto the Letter T.

8. The Main ſails of the main-Maſt, fore-Maſt, and boar-Sprit, are of a Quadrangular Parallelogram form; the top, and main top ſails ſomewhat ſharp, and growing narrow at the top; but the top Mizon ſails are ſharp, the lower or main ſails triangular.

9. In a ſhip of eleven hundred Tun, and was one hundred and twelve foot long in the Keel, and forty in breadth in the Hold: the main ſail of the main Maſt waſt two and forty foot deep, and eighty ſeven foot broad.

10. The top ſail of the ſame Maſt was fifty foot deep, and eighty four foot broad at the bottome, and forty two at the top.

11. The main top ſail was ſeven and twenty foot deep, and two and forty broad at the bottome, and one and twenty at the top.

12. The fore-Maſt main ſail was forty foot and a half deep, and ſeventy two foot broad.

13. The top ſail was ſix and forty foot and a half deep, and ſixty nine foot broad at the bottom, and ſix and thirty at the top.

14. The main top ſail was four and twenty foot deep, ſix and thirty foot broad at the bottom, and eighteen foot at the top.

15. The Mizon main ſail was on the upper part of the Yard one and fifty foot broad, in that part which was joined to the Yard ſeventy two foot, the reſt ending in a ſharp point.

16. The top ſail was thirty foot deep, fifty ſeven foot broad at the bottom, and thirty foot at the top.

17. If there be two Mizon-Maſts, the hindermoſt ſails are leſs than the formoſt about the fifth part.

18. The main ſail of the Boar-Spirit was eight and twenty foot deep and a half, and ſixty foot broad.

19. The top ſail five and twenty foot and a half deep, and ſixty foot broad at the bottom, and thirty at the top.

20. The proportions of Maſts and ſails do vary, not only according to the bigneſs of Ships, but alſo according to the ſeveral uſes for which they are built: Some for fighting, ſome for Merchandize, ſome for ſwiftneſs, &c. But the proportion of the dimenſion of ſails is no way proportioned to the number of Tuns whereof the Ships conſiſt, ſeeing a Ship of five hundred Tuns or thereabout, may bear almoſt as large a ſail as the other we ſpake of, which was almoſt as big again. Whence it proceeds that leſſer ſhips are far ſwifter and ſpeedier than great ones, not onely by reaſon of their lightneſs, but alſo by reaſon of the largeneſs of their ſails, in reſpect of the body of the ſhip: for to continue that proportion in bigger ſhips would be too vaſt, and impoſſible a thing.

21. Each ſail being ſtretched out at the top, and only tyed by the corners at the bottom, the wind muſt needs cauſe it to ſwell, eſpecially about the bottome where it is ſlacker.

22. The ſwelling if far greater in the lower ſails than in the upper, becauſe they are not only Parrallelograms, and the other more pointed at the top, but alſo becauſe the extent of the Yard doth ſo far exceed the breadth of the ſhip ſides to which they are faſtned, that of neceſſity, becauſe of the looſneſs, there muſt be a great receipt for the wind; ſo that in the great which we propoſed for an example, the ſwelling of the ſail in a direct wind may be nine or ten foot inward.

23. By the ſame reaſon it alſo happens, that all ſails which are ſwelled by the wind, do gather themſelves into a kind of Arch or bow, ſo that of neceſſity much wind muſt ſlip thorow: inſomuch, that in ſuch a ſhip as we made mention of, that Arch may be as high as a man.

24. But in the triangular ſail of the Mizon Maſt, there muſt of neceſſity be a leſſer ſwelling than in the quadrangular; as well becauſe that figure is leſs capable, as alſo becauſe that in the quadrangular three ſides are ſlack and looſe, but in the triangular only two, ſo that the wind is more ſparingly received.

25. The motion of the wind in ſails, the nearer it comes to the Beak of the ſhip, the ſtronger it is, and ſets the ſhip more forward; partly becauſe it is in a place, where becauſe of the ſharpneſs of the Beak head the waves are eaſilier cut in ſunder; but chiefely, becauſe the motion at the Beak draws on the ſhip, the motion from the Stern and back part of the ſhip doth but drive it.

26. The motion of the winds in the Sails of the upper tire, advances more than that in the lower tire, becauſe a violent motion is moſt violent when it is fartheſt removed from reſiſtance, as in the Wings and Sails of

Windmills; but there is danger of drowning or over-turning the ſhip: wherefore thoſe Sails are made narrower at the top, that they ſhould not take in too much wind, and are chiefly made uſe of when there is not much wind.

27. Sails being placed in a direct line, one behind the other, of neceſſity thoſe ſails which ſtand behind muſt ſteal the wind from the foremoſt, when the wind blows fore-right; wherefore if they be all ſpread out at once, the force of the wind hath ſcarce any power but in the main Maſt ſails, with little help of the lower ſails of the Boar Sprit.

28. The beſt and moſt convenient ordering of ſails in a direct wind, is, to have the two lower ſails of the fore-Maſt hoiſed up: for there (as we ſaid before) the motion is moſt effectual, let alſo the top ſail of the main Maſt be hoiſed up: for there will be ſo much room left under it, that there may be wind ſufficient for the fore ſails, without any notable ſtealing of the wind from them.

29. By reaſon of the hinder ſails ſtealing of the wind away from the fore ſails, we ſail ſwifter with a ſide wind than with a fore wind. For with a ſide wind all the ſails may be made uſe of, for they turn their ſides to one another, and ſo hinder nor rob not one another.

30. Likewiſe when a ſide wind blows, the ſails are ſtiflier ſtretched out againſt the wind, which ſomewhat reſtrains the wind, and ſends it that way as it ſhould blow, whereby it gains ſome ſtrength. But that wind is moſt advantagious which blows cornerly between a fore wind, and a ſide wind.

31. The lower Boar ſprit ſail can hardly ever be unuſeful, for it cannot be robbed from gathering the wind which way ſoever it doth blow, either about the ſhip ſides, or under the reſt of the ſails.

32. There is conſiderable in the motion of winds in ſhips, both the impulſion and direction of them: For that direction which is made by the Helm doth not much belong to the preſent Inquiſition but only as it hath a Connexion, with the motion of the winds in the ſails.

Connexion. As the motion of Impulſion or driving forward is in force at the Beak, ſo is the motion of Direction in the Poop; therefore for that the lower Mizon-Maſt ſail is of greateſt concernment, for it is as it were an aſſiſtant to the Helm.

33 Seeing the Compaſs is divided into two and thirty Points, ſo that the Semicircles of it are ſixteen points, there may be be a progreſſive ſailing (without any caſting aboard, which is uſed when the wind is clean contrary) though of the ſixteen parts there be but ſix favourable, and the other ten contrary. But that kind of ſailing depends much upon the lower ſail, of the Mizon-Maſt. For whilſt the adveſe parts of the wind being more powerful and not to be oppoſed by the Helm alone, would turn the other ſails, and the ſhip it ſelf againſt its intended courſe, that ſail being ſtiflly ſtretched, favouring the Helm, and ſtrengthening its motion, turns the Beak into the way of its courſe.

34. All manner of wind in the ſails doth ſomewhat burden and depreſs the ſhip, and ſo much the more, when it blows moſt from above. So that in greateſt ſtorms, firſt they lower their yards, and take away the upper ſails, and if need be all the reſt, cut down the Maſts, caſt their goods into the Sea, and their Ordinance, *&c.* to lighten the ſhip and make it ſwim, and give way to the waves.

35. By this motion of the winds in the ſails of ſhips, (if it be a merry and proſperous gale) a Merchants ſhip may ſail ſixſcore *Italian* miles in four and twenty hours;for there are certain Packet Boats which are built a purpoſe for ſwiftneſs, (that are called *Caravels*) which will go further. But when the wind is clean contrary, they flie to this laſt refuge, and a very weak one, to go on their courſe; namely to proceed ſide-way, as the wind will ſuffer them, out of their courſe, then turn their way again towards their courſe, and ſo proceed in an Angular way. By which progreſſion (which is leſs than creeping, for Serpents creep on by crooked turnings, but they make angles) they may in four and twenty hours go fifteen miles journy.

Greater Obſervations.

1. THis Motion of winds in ſails of ſhips hath three chief Heads and Fountains of its Impulſion or driving forward, from whence it flows and derives; whence alſo Precepts may be taken to increaſe and ſtrengthen it.

2. The firſt ſpring comes from the quantity of the wind which is received: For queſtionleſs more wind helps more than leſs: wherefore the quantity of wind muſt be carefully procured; which will be done, if like wiſe houſe-holders, we be good husbands, and take care nothing be ſtoln from us. Wherefore we muſt be very careful that no wind may be loſt.

3. The wind blows either above the ſhips, or below them, to the very ſuperficies and ſurface of the Sea: And as provident men uſe to look moſt after the leaſt things, (for the greater no man can chuſe but look after) ſo we will firſt look after theſe lower winds, which queſtionleſs cannot perform ſo much as the higher.

4. As concerning the winds which blow chiefly about the ſides of the ſhips,and under their ſails, it is the office of the main Boar ſprit ſail, which lies low and ſloping, to gather them into it, that there may be no waſte nor loſs of wind: and this of it ſelf does good, and hinders not the wind which fills the other ſails: And about this I do not ſee what can be done more by the induſtry of man, unleſs they ſhould perchance fix ſuch low ſails out of the middle of the ſhip, like wings,or feathers, two on each ſide when the wind blows right.

5. But concerning the bewaring of being robbed,which happens when the hinder ſails (in a fore-right wind) ſteal the wind away from the fore-ſails, (for in a ſide-wind all the ſails are ſet a work) I know not what can be added to the care man hath already taken to prevent it, unleſs when there is a fore-wind, there may be made a kind of ſtairs or ſcale of ſails, that the hindermoſt ſails of the Mizon-Maſt may be the loweſt, the middle ones at the main-Maſt a little higher, the fore-maſt, at the fore-Maſt, higheſt of all, that one ſail may not hinder, but rather help the other, delivering and paſſing over the wind from one to another. And let ſo much be obſerved of the firſt Fountain of Impulſion.

6. The ſecond Fountain of Impulſion conſiſts in the manner of ſtriking the ſail with the wind, which if through the contraction of the wind it be acute and ſwift, will move more,if obtuſe and languiſhing,leſs.

7. As concerning this, it is of great moment, and much to the purpoſe, to let the ſails have a reaſonable extenſion and ſwelling: for if they be

ſtretched out ſtiff, they will like a wall beat back the wind; if they be too looſe, there will be a weak Impulſion.

8. Touching this, humane Induſtry hath behaved it ſelf well in ſome things, though it was more by chance than out of any good judgment. For in a ſide wind, they gather up that part of the ſail as much as they can which is oppoſite againſt the wind: and by that means they ſet in the wind into that part where it ſhould blow. And this they do and intend. But in the mean ſeaſon this follows, (which peradventure they do not perceive) that the wind is more contracted, and ſtrikes more ſharply.

9. What may be added to humane induſtry in this, I cannot perceive, unleſs the figure of the ſails be changed, and ſome ſails be made which ſhall not ſwell round; but like a Spur or a Triangle, with a maſt or piece of timber in that corner of the top, that they may contract the wind more ſharply, and cut the outward air more powerfully. And that angle (as we ſuppoſe) muſt not be altogether ſharp, but like a ſhort obtuſe triangle, that it may have ſome breadth. Neither do we know what good it would do, if there were as it were a ſail made in a ſail; if there were in the middle of a greater ſail, there were a kind of a Purſe, not altogether looſe, of Canvas, but with ribs of wood, which ſhould take up the wind in the middle of the ſail, and bring it into a ſharpneſs.

10. The third Fountain or Original of Impulſion, is in the place where the wind hits; and that is two-fold: for from the fore-ſide of the ſhip, the Impulſion is eaſier and ſtronger than on the hinder part; and from the upper part of the Maſt, and ſail, than from the lower part.

11. Neither ſeems the Induſtry of man to have been ignorant of this, when in a fore-wind their greateſt hopes have been in their fore-Maſts, and in calms, they have not been careleſs in hoyſing up of their top ſails. Neither for the preſent do we find what may be added to humane Induſtry in this point; unleſs concerning the firſt, we ſhould ſet up two or three fore-Maſts (the firſt upright, and the reſt ſloping) whoſe ſails ſhall hang downward: and as for the ſecond, that the fore-ſails ſhould be enlarged at the top, and made leſs ſharp than they uſually are: But in both we muſt take heed of the inconvenience of danger, in ſinking the ſhip too much.

The Motion of Winds in other Engines of Mans Invention.

1. THe Motion of wind-mills hath no ſubtilty at all in it: and yet uſually it is not well explained nor demonſtrated. The ſails are ſet right and direct oppoſite againſt the wind which bloweth. One ſide of the ſail lies to the wind, the other ſide by little and little bends it ſelf, and gets it ſelf away from the wind. But the turning and continuance of the Motion is always cauſed by the lower part, namely, that which is fartheſt from the wind. But the wind over-caſting it ſelf againſt the Engine, is contracted and reſtrained by the four ſails, and is conſtrained to take its way in four ſpaces. The wind doth not well endure that compreſſion; wherefore of neceſſity it muſt as it were with its elbow hit the ſides of the ſails, and ſo turn them, even as little Whirligigs that Children play withal are turned with the fingers.

2. If the ſails were extended even and equally, it would be doubtful which way the inclination would be, as in the fall of a ſtaff; but when the nearer ſide which meets with the wind, caſts the violence of it upon the

lower ſide, and from thence into diſtances, ſo that when the lower ſide receives the wind, like the palm of the hand, or the ſail of a ſhips Boat, preſently there is a turning on that ſide. But this is to be obſerved, that the beginning of the motion proceeds not from the firſt Impulſion, which is direct, and a breaſt; but from the lateral Impulſion, which is after the compreſſion or ſtraightning of the wind.

3. We made ſome proofs and trials about this, for the increaſing of this motion, as well to be aſſured we had found the cauſe, as alſo for uſe; feigning an imitation of this Motion, with Paper Sails, and the wind of a pair of Bellows. We therefore added to the ſide of the lower ſail, a fold turned in from the wind, that the wind being become a ſide wind, might have ſomewhat more to beat upon; which did no good, that fold not ſo much aſſiſting the percuſſion of the wind, as in conſequence hindring the cutting of the air. We placed behind the ſails at ſome diſtance, certain obſtacles, as broad as the Diameter of all the ſails, that the wind being more compreſſed, might hit the ſtronger: but this did rather hurt than good, the repercuſſion dulling the primary motion. Then we made the ſails of a double breadth, that the wind might be the more reſtrained, and there might be a ſtronger lateral percuſſion; which at laſt proved very well: ſo that the Converſion was cauſed by a far milder gale, and did turn a great deal more ſwiftly.

Mandate. Peradventure this increaſe of motion might more conveniently be made by eight ſails, than by four, doubling the breadth, unleſs too much weight did over-burthen the motion: Which muſt have trial made of it.

Mandate. Likewiſe the length of ſails doth much conduce to the Motion. For in wheelings, a ſlight violence about the circumference, is equivalent to a far greater about the Center. But then this inconvenience follows, that the longer the ſails are, the more diſtant they are at the top, and the wind is ſo much the leſs ſtraightned. Peradventure the buſineſs would go well, if the ſails were a little longer and broader towards the top, like the outermoſt end of an Oar. But this we are not ſure of.

Monition. If theſe Experiments be made trial of in Wind-mills; care muſt be taken of the Wind-mill poſts, and the foundations of it: for the more the wind is reſtrained, the more it ſhakes (though it ſwiftens the motion of the ſails) the whole frame of the Mill.

4. It is reported, that in ſome Countreys there are Coaches and Waggons which move with the wind; but this muſt be more diligently looked after.

Mandate. Chariots moving by vertue of the wind, can be of no uſe, unleſs it be in open places and plains: Beſides, what will be done if the wind allays. It had been better to have thought of eaſing the Motion of Waggons and Coaches by ſails, which might be ſet up and taken down, to eaſe the Oxen or Horſes which draw them, rather than to make a Motion by wind alone.

Prognoſticks

Prognoſticks of Winds.

To the two and thirtieth Article.

Connexion.

THe more Divination uſeth to be polluted by vanity and ſuperſtition, ſo much more is the purer part of it to be received and honoured. But Natural Divination is ſometimes more certain, ſometimes more ſlippery and deceitful, according to the ſubject with which it hath to do; for if it be of a conſtant and regular nature, it cauſeth a certain prediction. If it be of a variable and irregular nature, it may make a caſual and deceitful one: Yet in a various ſubject the Prediction will hold true if it be diligently regulated, peradventure it may not hint upon the very moments, but in the thing it ſelf it will not erre much. Likewiſe for the times of the event and complement, ſome Predictions will hit right enough, namely, thoſe which are not gathered from the cauſes, but from the thing it ſelf already inchoated, but ſooner appearing, in an apt and fitly diſpoſed matter than in another, as we ſaid before in the Topicks concerning this two and thirtieth Article. We will now therefore ſet forth the Prognoſticks of winds, of neceſſity intermixing ſome of rain, and fair weather, which could not conveniently be ſeparated, remitting the full enquiry of them to their proper titles.

1. If the Sun appears hollow at its riſing, it will the very ſame day yield wind or rain; if it appears as it were a little hollow, it ſignifies wind; if deeply hollow, rain.

2. If the Sun riſes pale, or (as we call it) wateriſh, it betokens rain, if it ſet ſo, it betokens wind.

3. If the body of the Sun it ſelf appears at its ſetting of the colour of bloud, it foretokens great winds, for many days.

4. If at Sun riſing its beams appear rather red than yellow, it ſignifies wind rather than rain, and the like if they appear ſo at its ſetting.

5. If at Sun riſing or ſetting, its rays appear contracted or ſhortned, and do not ſhine out bright, though the weather be not cloudy, it ſignifies rain rather than wind.

6. If before Sun riſing there appear ſome rays as fore-runners, it ſignifies both wind and rain.

7. If the Sun at its riſing diffuſes its rays through the Clouds, the middle of the Sun remaining ſtill under Clouds, it ſhall ſignifie rain, eſpecially if thoſe beams break out downwards, that the Sun appears as it were with a Beard. But if the raies break forth out of the middle, or diſperſed, and its exterior body, or the out-parts of it be covered with clouds, it fore-ſhewes great tempeſts both of wind and rain.

8. If the Sun, when it riſes, be encompaſſed with a Circle, let wind be expected from that ſide on which the Circle opens. But if the Circle fall off all at one time, it will be fair weather.

9. If at the ſetting of the Sun there appears a white Circle about it, it ſignifies ſome ſmall ſtorm the ſame night: if black or darkneſs, much wind the day following.

10. If the Clouds look red at Sun-riſing, they are Prognoſticks of wind: if at Sun-ſetting, of a fair enſuing day.

11. If about the riſing of the Sun, Clouds do gather themſelves about it, they foreſhew rough ſtorms that day; but if they be driven back from the riſing towards the ſetting of the Sun, they ſignifie fair weather.

12. If at Sun-riſing the Clouds be diſperſed from the ſides of the Sun, ſome South-ward, and ſome North-ward, though the sky be clear about the Sun, it fore-ſhews wind.

13. If the Sun goes down in a Cloud, it fore-ſhewes rain the next day: but if it rains at Sun-ſetting, it is a token of wind rather. But if the Clouds ſeem to be as it were drawn towards the Sun, it ſignifies both wind and ſtorms.

14. If Clouds at the riſing of the Sun ſeem not to encompaſs it, but to lie over it, as if they were about to Eclipſe it, they fore-ſhew the riſing of winds, on that ſide as the Clouds incline. And if they do this about noon, they ſignifie both wind and rain.

15. If the Clouds have encompaſſed the Sun, the leſs light they leave it, and the leſſer the Orb of the Sun appears, ſo much the more raging ſhall the tempeſt be; but if there appear a double or treble Orb, as though there were two or three Suns; the Tempeſt will be ſo much the more violent for many days.

16. New Moons preſage the diſpoſitions of the Air: but eſpecially the fourth riſing of it, as if it were a confirmed New Moon. The full Moons likewiſe do preſage more than the days which come after.

17. By long obſervation, the fifth day of the Moon, is feared by Mariners for ſtormy.

18. If the New Moon do not appear before the fourth day, it foreſhews a troubled air for the whole Month.

19. If the New Moon at her firſt appearance, or within a few days after, have its lower horn obſcure, or dusky, or any way blemiſhed, it ſignifies ſtormy and tempeſtuous days before the Full Moon; if it be ill coloured in the middle, Tempeſts will come about the Full of the Moon: if it be ſo about the upper part of the horn, they will be about the decreaſing of the Moon.

20. If at the fourth riſing the Moon appear bright, with ſharp horns, not lying flat, nor ſtanding upright, but in a middle kind of poſture between both, it promiſes fair weather for the moſt part, until the next New Moon.

21. If at the ſame riſing it be red, it portends winds; if dusky or black, rain; but howſoever it ſignifies nothing beyond the Full Moon.

22. An upright Moon is almoſt always threatning, and hurtful, but it chiefly portends winds: But if it have blunt horns, and as it were cut off ſhort, it rather ſignifies rain.

23. If one horn of the Moon be ſharp, and the other blunt, it ſignifies wind; if both be blunt, rain.

24. If a Circle, or *Halo* appear about the Moon, it ſignifies rain rather than wind, unleſs the Moon ſtands directly within that Circle, for then it ſignifies both.

25. Circles about the Moon always foreſhew winds on that ſide where they break; alſo a notable ſhining in ſome part of the Circle, ſignifies winds from that part where the ſhining is.

26. If the Circles about the Moon be double or treble, they foreſhew horrible and rough Tempeſts, and eſpecially if thoſe Circles be not whole, but ſpotted and divided.

27. Full Moons, as concerning the Colours and Circles, do in a manner foreſhew the ſame things, as the fourth riſing, but more preſent, and not ſo long delayed.

28. Full Moons uſe to be more clear than the other ages of the Moon, and in winter uſe to be far colder.

29. The Moon appearing larger at the going down of the Sun, if it be ſplendent and not dusky, betokens fair weather for many days.

30. Winds almoſt continually follow the Eclipſes of the Moon; and fair weather the Eclipſes of the Sun; rain comes after neither.

31. From the Conjunctions of any of the Planets, but only the Sun, you may expect winds both before and after, from their conjunctions with the Sun, fair weather.

32. At the riſing of the *Pleiades*, and *Hyades*, come ſhowres of rain, but calm ones; after the riſing of *Arcturus* and *Orion*, tempeſts.

33. Returning and ſhooting ſtars (as we call them) ſignifie winds to come from that place whence they run, or are ſhot; but if they flye from ſeveral, or contrary parts, it is a ſign of great approaching ſtorms of wind and rain.

34. When ſuch little ſtars as thoſe which are called *Aſelli*, are not ſeen generally all over the sky, it foreſhews great tempeſts and rain within ſome few days. But if they be ſeen in ſome places, and not in other ſome, it foreſhews winds only, and that ſuddenly.

35. The sky when it is all over bright, in a New-Moon, or at the fourth riſing of it, portends fair weather for many days; if it be all over dark, it foreſhews rain, if partly dark, and partly fair, it portends wind of that ſide where the darkneſs is ſeen. But if it grow dark on a ſudden, without either Cloud or Miſt to dimn the brightneſs of the Stars, there are great and rough tempeſts a breeding.

36. If an entire Circle incloſeth a Planet, or any of the greater ſtars, it foreſhews wind; if it be a broken Circle, wind from thoſe parts where the Circle is deficient.

37. When the Thunder is more than the Lightnings, there will be great winds; but if the Lightnings be thick amidſt the thundering, it foreſhews thick ſhowres, with great drops.

38. Morning Thunders ſignifie wind, mid-day Thunders rain.

39. Bellowing Thunders which do as it were paſs along, preſage winds, and thoſe which make a ſharp and unequal noiſe, preſage ſtorms both of wind and rain.

40. When it lightens in a clear sky, winds are at hand, and rain from that part where it lightens: But if it lightens in diverſe parts, there will follow cruel and horrid tempeſts.

41. If it lightens in the cold quarters of the Heavens, namely, the Eaſt and North, Hail will follow; if in the warmer; namely, South and Weſt, we shall have rain and a warm sky.

42. Great heats after the Summer Solſtice, and commonly with Thunder and Lightning, and if thoſe come not, there will be wind and rain for many days.

43. The Globe of Flame, which the Ancient called *Caſtor*, which is ſeen by Mariners, and Seafaring men at Sea, if there be but one, preſages a cruel tempeſt, (*Caſtor* is the dead brother) and much more if it ſtick not cloſe to the Maſt, but dances up and down. But if they be twins, (and *Pollux* the living brother be preſent) and that when the tempeſt is high, it is a

good preſage: But if there be three (namely, if *Helen*, the Plague of all things come in) it will be a more cruel tempeſt: ſo that one ſeems to ſhew the indigeſted matter of the ſtorm, Two a digeſted and ripe matter; Three or more an abundance that will hardly be diſperſed.

44. If we ſee the Clouds drive very faſt when it is a clear sky, we muſt look for winds from that way from which the Clouds are driven: But if they wheel and tumble up together, when the Sun drawes near to that part in which they are tumbled up together, they will begin to ſcatter and ſever; and if they part moſt towards the North, it betokens wind, if towards the South, rain.

45. If at Sun-ſetting there ariſe black and dark Clouds, they preſage rain: If againſt the Sun, namely, in the Eaſt, the ſame night, if near the Sun in the Weſt the next day, with winds.

46. The clearing of a Cloudy sky, if it begins againſt the wind which then blows, ſignifies clear fair weather; with the wind it betokens nothing, but the thing remains uncertain.

47. There are ſometimes ſeen ſeveral as it were Chambers or joined Stories of Clouds one above the other, (ſo as *Gilbertus* affirms, he hath ſeen five of them together) and always the blackeſt are lowermoſt, though ſometimes it appears otherwiſe, becauſe the whiteſt do more allure the ſight. A double Conjunction of ſtories, if it be thick, ſhews approaching rain (eſpecially if the lower Cloud ſeem as it were big with Child) more Conjunctions preſage continuance of rain.

48. If Clouds ſpread abroad like Fleeces of wool here and there, they foreſhew Tempeſts: but if they lie one a top of another, like skales or tiles, they preſage drought and clear weather.

49. Feathered Clouds, like to the boughs of a Palm tree, or the flowers of a Rainbow, are Prognoſticks of preſent rain, or immediately to follow.

50. When Hills and Hillocks looks as though they wore Caps by reaſon of the Clouds lying upon them, and encompaſſing them, it preſages imminent Tempeſts.

51. Amber, or Gold Colour Clouds before Sun-ſetting, that have as it were gilded Helms or borders, after the Sun begins to be quite down, foreſhew fair clear weather.

52. Grayiſh, and as it were Clay-coloured Clouds, ſhew that rain with wind are drawing on.

53. Some petty Cloud shewing it ſelf ſuddenly, having not been ſeen before, and all the skie clear about it, eſpecially if it be in the Weſt, and about Noon, shews there is a ſtorm a comming.

54. Clouds and Miſts aſcending, and going upward, preſage rain, and that this be done ſuddenly, ſo that they be as it were ſucked up, they preſage rain: but if they fall and reſide in the Valleys, they preſage fair weather.

55. A big Cloud growing white, which the Ancients called a white Tempeſt, in Summer is a fore-runner of ſmall hail, like Comfits, in Winter ſnow.

56. A fair and clear Autumn preſages a windy winter; a windy winter, a rainy ſpring: a rainy ſpring a clear ſummer; a clear ſummer a windy Autumn. So that the year (as the Proverb goes) is ſeldom its own debtor, and the ſame order of ſeaſons will ſcarce happen two years together.

Fires upon the Hearth when they look paler than they are accuſtomed, and make a murmuring noiſe within themſelves, do preſage tempeſts. And if the flame riſes bending and turning, it ſignifies wind chiefly: and when the ſnuffs of Lamps and Candles grow like Mushromes with broad heads, it is a ſign of rainy weather.

58. Coals shining bright, and ſparkling over-much, ſignifie wind

59. When the ſuperficies of the Sea is calm and ſmooth in the Harbour, and yet murmures within it ſelf, though it doth not ſwell, ſignifies wind.

60. The shoars reſounding in a calm, and the ſound of the Sea it ſelf, with a clear noiſe, and a certain Eccho, heard plainer and further than ordinary, preſages winds.

61. If in a calm and ſmooth ſea, we eſpie froth here and there, or white Circles or Bubbles of water, they are Prognoſticks of winds; and if theſe Preſages be very apparent, they foreshew rough tempeſts.

62. If in a rough ſea there appear a shining froth (which they call ſea-lungs) it foreshews a laſting tempeſt for many days.

63. If the ſea ſwell ſilently, and riſes higher than ordinary within the Harbour, or the Tide come in ſooner than it uſes to do, it foretels wind.

64. Sound from the Hils, and the murmure of woods growing lowder, and a noiſe in open Champion fields, portends wind. Alſo a prodigious murmuring of the Element, without Thunder; for the moſt part preſages winds.

65. Leaves and ſtraws playing on the ground, without any breath of wind that can be felt, and the Down of Plants flying about, Feathers ſwimming and playing upon the water, ſignifie that wind is near at hand.

66. Water Fowls flying at one another, and flying together in flocks, eſpecially ſea-Mews and Gulls, flying from the ſea and lakes, and haſtning to the banks and ſhoars, eſpecially if they make a noiſe and play upon dry land, they are Prognoſticks of winds, eſpecially if they do ſo in the morning.

67. But contrariwiſe, ſea fowls going to the water, and beating with their wings, chattering and bathing themſelves, eſpecially the Crow, are all preſages of ſtorms.

68. Duckers and Ducks cleanſe their feathers with their Bills againſt wind: but Geeſe with their importunate crying call for rain.

69. A Hern flying high, ſo that it ſometimes flies over a low Cloud, ſignifies wind: But Kites when they flye high, foreshew fair weather.

70. Crows as it were barking after a ſobbing manner, if they continue in it, do preſage winds, but if they catchingly ſwallow up their voice again, or croak a long time together, it ſignifies that we shall have ſome showrs.

71. A chattering Owl was thought by the Ancients to fore-tel change of weather; if it were fair, rain; if Cloudy, fair weather: But with us the Owl making a clear and free noiſe, for the moſt part ſignifies fair weather, eſpecial in winter.

72. Birds pearching in trees, if they flie to their neſts, and give over feeding betimes, it preſages tempeſt: But the Hearn ſtanding as it were ſad and melancholy upon the ſand; or a Crow walking up and down, do preſage wind onely.

73. Dolphins playing in a calm ſea, are thought to preſage wind from that way they come: and if they play and throw up water when the Sea is rough, they preſage fair weather. And moſt kinds of fiſhes ſwimming on the top of the water, and ſometimes leaping, do prognoſticate wind.

74. Upon the approach of wind, Swine will be ſo terrified and diſturbed, and uſe ſuch ſtrange actions, that Country people ſay that Creature onely can ſee the wind, and perceive the horridneſs of it.

75. A little before the wind ſpiders work and ſpin carefully, as if they prudently foreſtall'd the time, knowing that in windy weather they cannot work.

76. Before rain, the ſound of Bels is heard further off; but before wind it is heard more unequally, drawing near and going further off, as it doth when the wind blows really.

77. *Pliny* affirms for a certain, that three leaved graſs creeps together, and raiſes its leaves againſt a ſtorm.

78. He ſayes likewiſe, that veſſels which food is put into, will leave a kind of ſweat in Cupboards, which preſage cruel ſtorms.

Monition. Seeing rain and wind, have almoſt a common matter, and ſeeing alwayes before rain, there is a certain condenſation of the air, cauſed by the new air received into the old, as it appears by the ſounding of the ſhoars, and the high flight of Hearns, and other things; and ſeeing the wind likewiſe thickens, (but afterward in rain the air is more drawn together, and in winds contrariwiſe it is enlarged) of neceſſity winds muſt have many Prognoſticks common with the rain. Whereof adviſe with the Prognoſticks of rain, under their own title.

Imitations of Winds.

To the three and thirtieth Article.

Connexion.

IF men could be perſwaded not to fix their contemplations over-much upon a propounded ſubject, and reject others as it it were by the bye; and that they would not ſubtilize about that ſubject in *infinitum*, and for the moſt part unprofitably, they would not be ſeized with ſuch a ſtupor as they are; but transferring their thoughts, and diſcourſing, would find many things at a diſtance, which near at hand are hidden. So that as in the Civil Law, ſo we muſt likewiſe in the Law of Nature, we muſt carefully proceed to ſemblable things, and ſuch as have a conformity between them.

1. Bellows with men are *Æolus* his Bags, out of which one may take as much as he needeth. And likewiſe ſpaces between, and openings of Hills, and crooks of buildings, are but as it were large bellows. Bellows are moſt uſeful either to kindle fire, or for Muſical Organs: The manner of the working of Bellows is by ſucking in of the air, to ſhun vacuity, (as they ſay) and to ſend it out by compreſſion.

2. We alſo uſe Hand Fans to make a wind, and to cool, only by driving forward of the air ſoftly.

3. The cooling of Summer rooms, we ſpake of in Anſwer to the ninth Article. There may other more curious means be found, eſpecially if the air be drawn in ſomewhere after the manner of bellows, and let out

at another place; But thoſe which are now in uſe have relation only to meer compreſſion.

4. The breath in mans *Microcoſmos*, and in other Animals, do very well agree with the winds in the greater world: For they are engendred by humours, and alter with moiſture as wind and rain doth, and are diſperſed and blow freer by a greater heat. And from them that obſervation is to be transferred to the winds, namely, that breaths are engendred of matter that yields a tenacious vapour, not eaſie to be diſſolved; as Beans, Pulſe, and Fruits; which is ſo likewiſe in greater winds.

5. In the diſtilling of Vitriol and other Minerals which are moſt windy, they muſt have great and large receptacles, otherwiſe they will break.

6. Wind compoſed of Niter and Gun-powder, breaking out and ſwelling, the flame doth not only imitate, but alſo exceed winds, which blow abroad in the world, unleſs they be ſuch as are made by thunder.

7. But the forces of it are preſſed in, as in humane Engines, as Guns, Mines, and Powder-houſes ſet on fire. But it hath not yet been tried whether in open air, a great heap of Gun-powder ſet on fire would raiſe a wind for certain hours, by the commotion of the air.

8. There lies hidden a flatuous and expanſive ſpirit in Quick-ſilver, ſo that it doth, (in ſome mens opinions) imitate Gun-powder, and a little of it mixed with Gun-powder, will make the Powder ſtronger. Likewiſe the Chymiſts ſpeak the ſame of gold that being prepared ſome way, it will break out dangerouſly, like to Thunder; but theſe things I never tried.

A greater Obſervation.

THe Motion of winds is for moſt things, ſeen as it were in a Looking-glaſs, in the motion of waters.

Great winds are Inundations of the air, as we ſee Inundations of waters, both through the augmentation of the quantity. As waters either deſcend from above, or ſpring out of the earth, ſo ſome winds are caſt down, and ſome riſe up. As ſometimes in Rivers there are contrary motions, one of the flowing of the Sea, the other of the Current of the River, yet both become one motion, by the prevailing of the flood; ſo when contrary winds blow, the greater ſubdues the leſſer. As in the Currents of the ſea, and of ſome rivers, it ſometimes falls out, that the waves above go contrary to the waves below: So in the air, when contrary winds blow together, one flyes over the other. As there are Cataracts of Rain within a narrow ſpace, ſo there are Whirlwinds. As waters, however they go forward, yet if they be troubled, ſwell up into waves, ſometimes aſcending, grow up into heaps, ſometimes deſcending, are as it were furrowed: ſo the winds do the ſame, but only want the Motion of Gravity. There are alſo other ſimilitudes which may be obſerved and gathered out of thoſe things which have already been enquired about.

Moveable Rules concerning Winds.

Connexion.

RUles are either particular or general, both with us are moveable; for as yet we have not affirmed any thing poſitively. Particular Rules may be taken and gathered almoſt out of every Article. We will cull out ſome general ones, and thoſe but a few, and adde thereunto.

1. Wind is no other thing but moved air; but the air it ſelf moved either by a ſimple impulſion, or by commixion of vapors.

2. Winds by a ſimple Impulſion are cauſed four ways, either by the natural Motion of the air, or by expanſion of the air, in the Suns ways; or by reception of air thorow a ſudden cold; or by the compreſſion of the air by external bodies.

There may be alſo a fifth way, by the agitation and concuſſion of the air by ſtars. But let theſe things be a while ſilent, or be given ear unto with a ſparing belief.

3. Of winds which are made by immixion of vapours, the chief cauſe is the over-burthening of the air, by air newly made out of vapours, whereby the maſs of the air grows bigger, and ſeeks new room.

4. A ſmall quantity of air added, cauſeth a great tumor of the air round about it: ſo that new air out of the reſolution of vapours doth confer more to motion than to matter. But the great body of wind conſiſts in the former air, neither doth the new air drive the old air before it, as if they were ſeveral bodies; but being both commixt, they deſire larger room.

5. When any other beginning of Motion concurs, beſides the over-burthening of the air, it is an acceſſory which ſtrengthneth and encreaſeth that Principal, which is the reaſon that great and violent winds do ſeldom riſe, by the ſimple over-burthening of the air.

6. Four things are acceſſory to the over-burthening of the air: The breathing out of ſubterraneal places; the caſting down out of (as it is called) the middle region of the air, Diſſipation made out of a Cloud, and the Mobility and Acrimony of the Exhalation it ſelf.

7. The Motion of the wind is for the moſt part lateral: But that which is made by meer over-burthening, is ſo from the beginning, that which is made by the expiration of the earth, or repercuſſion from above, a little while after, unleſs the Eruption, or Precipitation, or Reverberation be exceeding violent.

8. Air will endure ſome compreſſion, before it be over-burthened, and begins to thruſt away the adjoyning air, by reaſon whereof all winds are a little thicker than quiet and calm air.

9. Winds are allayed five ways, either by the conjunction of vapours, or by their ſublimation, or by tranſporting them, or by their being ſpent.

10. Vapors are conjoyned, and ſo the Air it ſelf becomes water, four ways, either by abundance aggravating, or by colds condenſing, or by contrary winds compelling, or by obſtacles reverberating.

11. Both Vapours and Exhalations, but wind very frequently from vapours. But there is this difference, that winds which are made of Vapours, do more eaſily incorporate them ſelves into pure air, are ſooner allayed, and are not ſo obſtinate as thoſe winds which are engendred of Exhalations.

12. The manner and ſeveral conditions of heat have no leſs power in the generation of winds, than the abundance or conditions of the matter.

13. The heat of the Sun ought to be ſo proportioned in the generation of winds, that it may raiſe them, but not in ſuch abundance as that they gather into rain, nor in ſo ſmall a quantity, that they may be quite ſhaken off and diſperſed.

14. Winds blow from their Nurſeries, and the Nurſeries being diſpoſed ſeveral ways, divers winds for the moſt part blow together, but the ſtrongeſt either quite overthrows, or turns into its current the weakeſt.

15. Winds are engendred every where, from the very Superficies of the earth, up into the middle Region of the air, the more frequent below, but the ſtronger above.

16. The Countries which have retaining or trade-winds, if they be warm, have them warmer that according to the meaſure of their Climate: if they be cold, they have them colder.

A Humane Map, or Optatives, with ſuch things as are next to them concerning Winds.

Optatives.

1. TO frame and diſpoſe ſails of ſhips in ſuch a manner, that with leſs wind they might go a greater journey; a thing very uſeful to ſhorten journeys by ſea, and ſave charges.

Next. The next invention preciſely in practice I have not as yet found; yet concerning that, look upon our greater obſervations upon the ſix and twentieth Article.

2. *Optative.* That we could make Wind-mills, and their ſails in ſuch manner that they may grind more with leſs wind. A thing very uſeful for gain.

Next. Look concerning this upon our Experiments in the anſwer to the ſeven and twentieth Article, where the thing ſeems to be as it were done.

Optative. To foreknow when winds will riſe and allay: A thing uſeful for Navigation and for Husbandy, eſpecially for the chuſing of times for Sea-fights.

Next. To this belong many of thoſe things which are obſerved in the Inquiſition, and eſpecially in the Anſwer to the two and thirtieth Article. But a more careful obſervation hereafter (if any ſhall apply their mind to it) will give far more exact Prognoſticks, the cauſe of the winds being already laid open.

4. *Optative.* To give judgment, and make Prognoſticks by winds, of other things, as firſt, whether they be Continents or Iſlands in the Sea in any place: or rather a free open ſea; a thing very uſeful for new and unknown voyages.

Next. The next is the obſervation concerning conſtant and trade-winds: that which *Columbus* ſeemed to make uſe of.

5. *Optative.* Likewiſe of the plenty or ſcarcity of corn every year. A thing uſeful for gain, and buying before-hand, and fore-ſtalling, as it is reported of *Thales*, concerning a Monopoly of Olives.

Next. To this belong ſome things ſpecified in the Inquiſition of winds, either hurtful, or ſhaking winds, and the times when they do hurt; to the nine and twentieth Article.

6. *Optative.* Likewiſe concerning Diſeaſes and Plagues every year. A thing uſeful for the credit of Phyſicians, if they can fore-tel them alſo for the cauſes and cures of Diſeaſes, and ſome other civil conſiderations.

Next. To this likewiſe belong ſome things ſet down in the Inquiſition to the thirtieth Article.

Monition. Of Predictions by wind concerning corn, fruits, and diſeaſes, look upon Hiſtories of Husbandry and Phyſick.

Optative. 7. How to raiſe winds and to allay them.

Next. Concerning theſe things there are ſome ſuperſtitious opinions, which do not ſeem worthy to be inſerted into a ſerious and ſevere Natural Hiſtory: Nor can I think of any thing that is near in this kind. The deſign may be this, to look throughly into, and enquire about the Nature of the air; whether any thing may be found, whereof a ſmall quantity put into air, may raiſe and multiply the motion to dilatation, or contraction in the body of the air. For out of this (if it might be done) would follow the raiſings and allayings of winds. Such as that Experiment of *Pliny* is concerning Vinegar thrown againſt the Whirlwinds, if it were true. Another deſign might be, by letting forth of winds out of ſubterraneal places; if ſo be they ſhould gather together any where in great abundance, as it is a common and approved opinion of the Well in *Dalmatia*: but to know ſuch places of priſons, is very hard and difficult.

8. *Optative.* To work many fine, pleaſant, and wonderful conceits by the motion of winds.

Next. We have not leiſure to enter into conſideration touching theſe things: Next to it is that common report of the Duels of winds. Queſtionleſs many ſuch pleaſant things might very well be found out, both for Motions and Sounds of Winds.

An Entrance to the Titles appointed for the next five Months.

The Hiſtory of Denſity and Rarity.

The Entrance.

IT is no marvail if nature be indebted to Philoſophy and the Sciences, ſeeing it was never yet called upon to give an account, for there never was any diligent and diſpenſatory Inquiſition made of the quantity of the matter, and how that had been diſtributed into bodies (in ſome copiouſly, in others ſparingly) according to the true,or at leaſt trueſt accounts that hath been truely received and approved of, that nothing is taken away and loſt, or added unto the univerſal ſumme. Likewiſe that place hath been treated upon by ſome, namely how it can be looſened or contracted without intermixion or vacuity, according to more or leſs: But the Natures of Denſity and Rarity, ſome have referred to the abundance or ſcarcity of the matter, another hath laughed at the ſame; the greateſt part following their Author, do diſcuſs and compoſe the whole matter by that cold and weak diſtinction of act,and power. Thoſe alſo who attribute them to the reaſons of matter (which is the true opinion) do neither quite deprive the *Materia prima*, or primary matter of its *Quantum*, or quantity, though for other forms they will have it equal, but here do terminate and end the matter, and ſeek no further, nor do not perceive what followeth thereby; and either do not touch at all,or at leaſt do not urge home that which hath a regard to infinites, and is as it were the Baſis and ground of Natural Philoſophy.

Firſt therefore that which is rightly ſet down muſt not be moved nor altered; namely, that there is no tranſaction made in any tranſmutation of bodies, either from nothing, or to nothing: but that they are works of the ſame omnipotence, to create out of nothing,and to reduce unto nothing, and that by courſe of Nature this can never be done. Therefore the ſumme of the total matter ſtands ſtill whole, nothing is added, nothing is diminiſhed: yet that this ſum is divided by portions amongſt the bodies, is unqueſtionable, for there can no man be ſo much beſide himſelf through any ſubtile abſtractions as to think that there is as much matter in one veſſel of water as in ten veſſels of water, nor likewiſe in one veſſel of air, as much as in ten veſſels of air. But in the ſame body there is no queſtion but that the abundance of matter is multiplied according to the meaſure of the body, in divers bodies it is queſtionable. And if it be demonſtrated that one veſſel of water turned into air, will yield ten veſſels of air, (for we take this computation for a received opinion, though that of a hundred fold be the truer) it is well; for now they are no more divers bodies, water and air, but the ſame body of air in ten veſſels: But one veſſel of air (as it was but now granted) is but onely the tenth part of ten veſſels. Therefore it cannot be contradicted, but that in one veſſel of Water, there is ten times more matter than in one veſſel of air: Therefore if one ſhould affirm, that one whole veſſel of water could be converted into one veſſel of air, it were as much as if one ſhould affirme that ſomething could be reduced to nothing: for as much as one tenth part of water would ſuffice to do it, and the other nine parts muſt of neceſſity be reduced to nothing: And contrariwiſe, if one ſhould affirm that one veſſel of air could be turned into a veſſel of water, it would be as much as if he ſhould ſay, that ſomething could be created out of nothing: for one veſſel of air can attain and reach but unto the tenth part of a Veſſel of water, and the other nine parts muſt needs proceed from nothing. In the mean time we will plainly acknowledg and confeſs, that to underſtand the true means of the reaſons and calculations, of the how much part of the *Quantum*, or how much of the matter which is in divers bodies, and by what induſtry and ſagacity one may be truly informed thereof, is a high matter to be enquired; but ſuch as the great and largely extended profit which will accrue thereby will largely recompence. For to know the Denſities and Rarities of the body, and much more how to procure, and effect the Condenſations and Rarefactions, is of great importance and moment both to contemplative, and to the Practick. Seeing then it is a thing (if any there be at all) meerly fundamental and univerſal; we muſt go carefully, and prepared about it, ſeeing that all Philoſophy without it is looſe and disjointed.

The Hiſtory of Heavy and Light.

The Entrance.

THe Motion of Gravity and Lightneſs, the Ancients did illuſtrate with the name of Natural Motion: For they ſaw no external efficient, nor no apparent reſiſtance; yea the motion ſeemed ſwifter in its progreſs. This contemplation, or rather ſpeech, they ſeaſoned with that Mathematical Phantaſie of the ſtaying or ſtopping of heavy things at the center of the earth (although the earth ſhould be bored quite thorow) and that Scholaſtical Invention of the motion of bodies to their ſeveral places. Having laid or ſet down theſe things, ſuppoſing they had done their parts, they looked no further, but onely that which ſome of them more carefully enquired after, namely, of the Center of Gravity in divers figures, and of ſuch things as are carried by water. Neither did any of the Modern Authors do any thing worth ſpeaking of concerning this, onely by adding ſome few Mechanical things which they had alſo wreſted with their Demonſtrations: But laying many words aſide, it is moſt certain, that a body cannot ſuffer but by a body: Neither can there be any Local Motion made, unleſs it be ſolicited or ſet forward, either by the parts of the body it ſelf which is moved, or by the adjacent bodies, which either touch it, or are near unto it, or are at leaſt within the Orb of its Activity. So that *Gilbertus* did not unknowingly introduce Magnetick powers, he alſo becomming a Loadſtone, namely, drawing more things by thoſe powers than he ſhould have done, and building a Ship as it were of a round piece of wood.

The Hiſtory of the Sympathy and Antipathy of things.

The Entrance.

STrife and amity in Nature are the eggers on of motions, and the Keys of works. Hence proceeds the union and diſſention of bodies; hence the mixion and ſeparation of bodies; hence the high and intimate impreſſions of vertues, and that which they call joyning of actives with paſſives: finally they are the great and wonderful works of nature. But this part of Philoſophy, namely of the Sympathy and Antipathy of things is moſt impure, which alſo they call Natural Magick: and (which always likely comes to paſs) where diligence and care hath wanted, there hath hope remained: But the operation thereof in men is meerly like unto certain Soporiferous Medicines which caſt one aſleep, and do moreover ſend and infuſe into him merry and pleaſant Dreams. For firſt it caſts mans underſtanding into a ſleep, repreſenting unto him ſpecifical Properties, and hidden Vertues, whereby men awake no more, nor look after the finding and ſearching out of true cauſes; but acquieſce and lie ſtill in theſe idle ways. Then it inſinuates an innumerable company of fictions like unto Dreams; And vain men hope to know the Nature by the outward ſhape and ſhew, and by extrinſecal ſimilitudes to diſcover inward Properties. Their Practiſe alſo is very like unto their Enquiry: For the Precepts of Natural Magick are ſuch, as if men ſhould be confident that they could ſubdue the earth, and eat their bread without the ſweat of their Brow, and to have power over things by idle and eaſie applications of bodies; and ſtill they have in their mouths, and like undertakers or Sureties, they call upon the Loadſtone, and the conſent which is between Gold and Quickſilver; and ſome few things of this kind they alledge, for to prove other things, which are not bound by any ſuch like contract. But God hath appointed the beſt of things to be enquired out and be wrought by labours and endeavours. We will be a little more carefull in ſearching out the law of Nature, and the mutual Contracts of things, neither favouring Miracles, nor making too lowly and ſtraightned an Inquiſition.

The Hiſtory of Sulphur, Mercury, and Salt.

The Entrance.

THis triple of Principles hath been introduced by the Chymiſts, and as concerning Speculatives is of them which they bring the beſt Invention. The moſt ſubtile and acute of theſe, and thoſe who are moſt Philoſophical, will have the Elements to be Earth, Water, Air, and the skie. And thoſe they will not have to be the Matter of things, but the Matrixes in which the Specifical ſeeds of things do engender in the nature of a Matrix. But for the *Materia prima*, or primary matter, (which Scholars do lay down as it were naked, and indifferent) they ſubſtitute thoſe three, Sulphur Mercury and Salt; out of whith all bodies are gathered together and mixed. We do accept of their words, but their opinions are not very ſound. Yet that doth not ill agree with their opinion, namely, that we hold two of them, to wit, Sulphur and Mercury (taken according to our ſence) to be very firſt and prime natures, and moſt inward figurations of matter, and almoſt chief amongſt the forms of the firſt Claſſis. But we may vary the words of Sulphur and Mercury, and name them otherwiſe Oyly, Wateriſh, Fat, Crude, Inflamable, not Inflamable, or the like. For theſe ſeem to be two very great things of the three, and which poſſeſs and penetrate the Univerſe; for amongſt ſubterraneal things, they are Sulphur and Mercury, as they are called; in the Vegetable and Animal kind, they are Oyl and Water; in the inferior ſpiritual things, they are Air and Flame; in the heavenly, the body of a Star, and the pure skie; but of this laſt Duality we yet ſay nothing, though it ſeem to be a probable decyphering: For if they mean by Salt, the fixed part of the body, which is not reſolved either into flame or ſmoak, this belongeth to the Inquiſition of fluid, and determinate things. But if we take Salt according to the Letter without any Parabolical meaning, Salt is no third thing from Sulphur and Mercury, but mixed of both, connexed into one, by an acrimonious and ſharp ſpirit. For all manner of Salt hath inflamable parts; and other parts alſo, which not only will not take fire, but do alſo abhor it and flie from it: Yet the Inquiſition of Salt, being ſomewhat allyed to the Inquiſition of the other two, and exceeding uſeful, as being a tye and band of both Natures, Sulphurous and Salt, and the very Rudiment of life it ſelf, we have thought fitting to comprehend it alſo within this Hiſtory and Inquiſition. But in the mean time we give you notice, that thoſe ſpiritual things, Air, Water, Stars, and Skie, we do (as they very well deſerve it) reſerve them for proper and peculiar Inquiſitions, and here in this place to ſet down the Hiſtory only, of tangible, that is to ſay, Mineral or Vegetable Sulphur and Mercury.

The Hiſtory of Life and Death.

The Entrance.

THere is an old complaint of the ſhortneſs of life, and tediousneſs of Art. Therefore it ſeems very fitting to us, who ſtrive to the uttermoſt of our powers to make Arts perfect, to take care alſo of prolonging the Life of man, the Author of Life and Truth aſſiſting us therein. For although mens lives be nothing elſe, but an increaſe and accumulation of ſins and miſeries; and that life is but of ſmall advantage to thoſe who aſpire to Eternity: Yet we who are Chriſtians ſhould not contemn or deſpiſe a continuation of works of Charity. And the beloved Diſciple lived longer than any of the reſt; and many of the Fathers, eſpecially the holy Monks, and Hermites, were long lived. And there was leſs taken away from this bleſſing, (ſo often made mention of in the old Law) than from any other earthly bleſſing, after the coming of our Savior. But it is plain & manifeſt enough, that this is held for a great good: but how to attain thereunto, is a high and myſterious queſtion;

and ſo much the more, becauſe it hath been abuſed both by falſe opinions and falſe Præconiums. For thoſe things which are commonly ſpoken of by the Rabble of Phyſicians, concerning the Radical Humour, and Natural Heat, are deceitful. And the immoderate praiſes of Chymical Medicines, firſt ſwell men up with hopes, and then forſake them, and leave them in the mire. Neither is our Inquiſition now of that death which proceeds from ſuffocation, putrifaction, and divers other Diſeaſes; for that belongs to a Phyſical or Medicinal Hiſtorie; but of that Death only which comes by the Reſolution and conſumption of old age. Yet to enquire of the laſt paſſage or ſtep to death, and the very extinction or putting out of life, which may be done by many, both internal and external ways (which notwithſtanding have as it were one and the ſelf ſame place of habitation, before we come unto the very pangs of death.) I believe hath ſome affinity with our preſent Inquiſition, but we will ſet that in the laſt place. That which may be repaired by degrees and without deſtruction, the primary entire thing, that in *potentia* is eternal as the Veſtal fire. Wherefore when the Philoſophers and Phyſicians ſaw, that creatures were nouriſhed, and that their bodies were repaired and made up again; yet that it could not laſt long, but that a while after they grew old, and dyed, they ſought for death in ſome thing, which properly could not be repaired, thinking that ſome Radical and firſt engendred Humor is not totally repaired, but that there is even from the infancy ſome degenerate addition, and not a preciſe, ſolid and juſt reparation, which by degrees is depraved with age, and at laſt brings that which is depraved to nothing. Theſe unskilful and erroneous opinions they hold. For all things in youth and young age are fully and wholly repaired, and for a time increaſe in quantity, and are bettered in quality: ſo that the matter of Reparation might in a manner be eternal, if the means of Reparation did not fall away. But indeed in a declining age, there is but a very unequal Reparation made. In ſome parts Reparation proceeds happily, and other parts grow worſe and worſe; and from that time men begin to endure that torment which *Mezentius* did uſe to inflict, namely to kill living men with the embraces of dead ones; and thoſe things, which might eaſily be repaired do fail by being joyned to thoſe things which can hardly be repaired. For even after that men do begin to decline through age, their Spirit, Bloud, fleſh and Fat may eaſily be repaired; but thoſe parts which are more Porous, all Membranes and Tunicles, Nerves, Arteries, Veins, Bones, Cartilages, moſt part of the Inwards, and finally almoſt all the Organical parts, are difficultly, and with great loſſe repaired. And thoſe parts being to aſſiſt the reparation of thoſe Reparable parts which are actually to be repaired, loſing their activity and ſtrength, can no longer performe their function. And from thence a while after proceeds the falling to ruin of all together; and thoſe very ſame parts, which in their own Nature are very Reparable, the Organs of Reparations failing, cannot be well repaired, but decreaſe, and at laſt totally fail. And the cauſe of the Period, is becauſe the ſpirit preying alwayes like a ſtill and gentle Flame, the external air (which alſo ſucks and dries up the bodies) conſpiring with it, at the laſt ruins the frame of the body and its Organs, and makes them unable to performe the act of Reparation: And theſe are the true ways of Natural Death, which are carefully to be revolved in mans mind. For he that knows not the ways of Nature, how can he obviate and turn them? Therefore there ought to be a double Inquiſition: one of the Conſumption,or Depredation of the body of man ; and the other of the Reparation or Refection of the ſame. And with this *proviſo* or Caveat that the one may be inhibited and reſtrained, and the other promoted and comforted as much as may be : and the firſt of theſe belongs chiefly to the ſpirits and external air, by which the Depredation and waſte is made ; the ſecond to the whole proceſs of alimentation, which cauſeth the Reſtitution. And as for the firſt part of the Inquiſition, which is of the Conſumption, that is for a great part common to inanimate bodies : For thoſe things which the inbred ſpirit (which is in all Tangible things be they living or dead) and the encompaſſing Air do operate upon inanimate things, the ſame they do alſo attempt upon thoſe things which are animate : though the Vital which is added unto them, partly breaks and quels thoſe operations, and partly doth moſt powerfully increaſe and augment them. For it is moſt manifeſt, that many inanimate things can laſt a long time without any Reparation ; whereas animate things do preſently fall and are extinguiſhed without Aliment or Reparation, as the fire alſo. Therefore there ought to be a double Inquiſition : Firſt, Contemplating mans body, as Inanimate, and without Aliment : Then as it is Animate and Alimented. And having ſpoken thus much by way of Preface,let us now proceed to the Topicks of the Inquiſition ; concerning which you muſt read the Hiſtory of Life and Death.

FINIS.

THE NATURAL AND EXPERIMENTAL HISTORY OF *THE FORM of HOT THINGS.*

The Inquiſition of Forms proceeds thus.

The firſt Aphoriſm.

UPon the propoſed Nature, firſt there muſt be an apparance made before the underſtanding of all the known Inſtances which agree in the ſame Nature, though the matters be very unlike: And this Collection is to be made Hiſtorically, without any over-haſty Contemplation, or any tranſcendent ſubtilty: as for example in the Form of Hot Things.

Convenient Inſtances in the Nature of Hot Things.

1. The Beams of the Sun, eſpecially in Summer, and at Noon time.
2. The Sun beams reflected, and kept up cloſe and drawn together, as among Hills, or by Wals, and eſpecially in Burning-glaſſes.
3. Fiery Meteors.
4. Burning Lightnings.
5. The breaking out of fire, out of the hollow parts of Hils, *&c.*
6. All manner of Flame.
7. Solid things ſet on fire.
8. Natural hot Baths.
9. Liquid things boyling or heated.
10. Hot ſmoaks and vapours, and the Air it ſelf, which takes a ſtrong and fierce heat if it be ſhut in, eſpecially in Reverberatories.
11. Certain ſoultry hot times by the meer Conſtitution of the air, without any regard of the ſeaſon, or time of the year.

12. A ſubterraneal Air, encloſed in certain Caves, eſpecially in winter time.

13. All woolly or hairy things, as Beaſts Skins, or Hides, and Feathers, have a kind of warmneſs in them.

14. All manner of bodies, as well ſolid as liquid, as well thick as thin (ſuch as the air it ſelf is) being for a time brought near the fire.

15. Sparkles out of a Flint-ſtone, or out of Iron or Steel, cauſed by hand-ſtriking.

16. Any kind of body ſtrongly rubbed together, as ſtone, wood, cloth, *&c.* ſo that ſometimes Axel-trees, and Naves of Wheels are ſet on fire: and the way of kindling of fire amongſt the Weſt Indians is by Attrition.

17. Green and moiſt herbs packt and thruſt up together, as Roſes, and Peaſecods, and Hay being laid up moiſt will many times take fire.

18. Unſlackt quick Lime having water thrown upon it.

19. Fire when it is firſt diſſolved by ſtrong waters, or *Aqua Fortis* in a Glaſs, without ſetting any fire to it; and ſo likewiſe Pewter, *&c.* but not in ſuch a high degree.

20. Living creatures, eſpecially (and that continually) their Entrails; though in the Inſects the heat be not ſo palpably perceived by the ſenſe of feeling, by reaſon of the ſmalneſs of their bodies.

21. Horſe-dung, and the like Excrements of beaſts being newly made.

22. Strong oyl of Sulphur and Vitriol, ſhew the effects of heat in burning of linnen.

23. Oyl of *Origanum* and the like, ſhew their effects of heat alſo in burning of the teeth.

24. A ſtrong ſpirit of Wine rightly made up, will ſhew the effects of its heat in ſuch manner, that if you put the white of an egge into it, it will grow together and be white, almoſt like that of a boiled egge, and a piece of bread being thrown into it, will heat and be like unto a piece of toaſted bread.

25. Spices and hot herbs, as Dragon, and old Creſſes, *&c.* though they be not hot in the handling (neither whole nor yet the powder of them) yet being a little chewed, they are hot, and in a manner burning upon the tongue and the Palate of the mouth.

26. Strong Vinegar, and all ſharp ſour things laid upon any part where there is no upper skin, as in the eye, or upon the tongue, or any other part when it is wounded or galled, do cauſe a kind of ſmart, like unto that which is produced by heat.

27. Alſo ſharp and violent cold produceth a kind of tingling, like unto burning.

The Northern winds ſharp penetrating cold burneth, *&c.*

28. Other things alſo which I omit for brevity.

This we uſe to call the Table of Eſſence and preſence.

The ſecond Aphoriſm.

SEcondly, there is manifeſtation to be made to the underſtanding of inſtances which are deprived of their nature which was firſt given them. For the Forme (as we ſaid before) ought as well to be abſent where the primary Nature is abſent, as be preſent where it is preſent: But this would be infinite in all things. Wherefore Negatives are to be added to the Affirmatives, and Privations are onely to be looked upon in thoſe ſubjects, which are nearly allyed to thoſe others in which the Primary Nature is, and appears. And this we uſe to call the Table of Declination or Abſence *inproximo*, or the next degree.

The neareſt Inſtances which are deprived of the Nature of Heat.

A Negative, or Subjunctive Inſtance to the firſt Affirmative Inſtance.

The Moon and the ſtars and the Comets Beams are not found hot by the ſence of feeling, yea one may obſerve extreame cold ſeaſons at full Moons. But the greater fixed Stars when the Sun comes under them, or nigh unto them, are thought to increaſe and exaſperate the heat of the Sun, as it is when the Sun is in *Leo*, and in the Dog-days.

Six Negatives to the ſecond Inſtance.

1. The Sun-beams give not any heat in that which they call the middle Region of the air; for which is commonly given a tolerable reaſon. For that Region or part of the air is neither near unto the body of the Sun, from which iſſue the beams, nor yet unto the earth, by which the ſaid beams are reflected. And this appears by the tops of thoſe Hills which are of a great height, where the Snow lyeth continually. But on the contrary, it hath been noted by ſome, that on the top of the Peak of *Tenariff*, and alſo of ſome Hills of *Peru*, the tops of the hils have no ſnow upon them, the ſnow lying lower upon the aſcent of the Hill: and beſides, the air is not cold upon the tops of thoſe Hils, but very piercing and ſharp; ſo that upon thoſe hils of *Peru*, it pricks and hurts the eyes with its too much acrimony, and pricks the Orifice of the Ventricle, and cauſeth vomiting. And it was noted by the Ancients, that on the top of *Olympus* there was ſuch a tenuity of air, that they who aſcended thither were fain to carry with them ſpunges ſteeped in Water and Vinegar, and hold them to their mouths and noſtrils, leſt the tenuity or ſubtilneſs of the Air ſhould hinder their breathing. Upon the top of which montain it was alſo ſaid the air was ſo clear and free from Winds and Rain, that if the Prieſts had written upon the Aſhes which remained upon *Jupiters* Altar after the Sacrifices had been there offered unto him, the Letters would remain there and not be blown away or blotted out, until the next year. And to this hour thoſe which aſcend to the top of *Tenariff*, which they do by night, and not by day, are called upon and haſtned to deſcend preſently after Sun-riſing. For fear (as it ſhould ſeem) leſt the tenuity of the air ſhould diſſolve their ſpirits, and ſuffocate them.

2. The reflexion of the Sun-beams in thoſe Countries which are nigh unto the Polar Circles, is very weak and ineffectual in its heat: ſo that the *Dutch* who wintred in *Nova Zembla*, when they expected their ſhip ſhould be freed from the great heaps and mountains of Ice which were grown about it in the beginning of the Month of *July*, were fruſtrated of their hopes, and forced to come away in their ſhip boat: So that the Beams of the Sun ſeem to be of ſmall ſtrength when they are direct, even

upon plain ground: nor yet when they are reflected, unleſs they be multiplyed and united, which happeneth when the Sun grows to be more perpendicular; for the incidence of the beams makes more acute Angles, ſo that the lines of the beams are more near; whereas contrariwiſe in great obliquities of the Sun, the Angles are very obtuſe, and conſequently, the lines of the beams more diſtant. But in the mean time we muſt note that there may be many operations of the Sun-beams, and in the nature of heat, which are not proportioned to our touch, or feeling; ſo that in reſpect of us they do not operate ſo far as calefaction or heating, but in reſpect of ſome other bodies, they may execute the Operations and Functions of heat.

3. Let us try ſuch an experiment as this. Let there be a Glaſs made and framed of a contrary quality to a burning-Glaſs, and let this glaſs be held between the Sun and our hand, and let us obſerve whether that will diminiſh the heat of the Sun as a burning-Glaſs doth increaſe it. For it is manifeſt in the Optick beams, that as the Glaſs is of an unequal thickneſs in the middle and on the ſides, ſo the things which are ſeen thorow them, are either more diffuſed, or more contracted. So the ſame ſhould be in the matter of heat.

4. Let it be carefully tryed, whether the ſtrongeſt and beſt made Burning-Glaſſes can gather up the beams of the Moon in ſuch ſort as the leaſt degree of warmneſs or tepidity may proceed from them. And if that degree of tepidity ſhould be too weak and ſubtile to be perceived by the ſenſe of feeling; let recourſe be had to thoſe kinds of Weather-Glaſſes that ſhew the Conſtitution of the air, whether it be hot or cold, and let the Moon-beams fall thorow a burning-Glaſs into the Orifice of this Weather-Glaſs, and obſerve whether the tepidity do cauſe any fall or abatement of the water that is in the ſaid Weather-Glaſs.

5. Let the Burning-Glaſs be uſed over ſome hot thing that is not radious, or luminous; as a hot Iron or ſtone, which is not red or fire hot, or boyling water, or the like: and let it be obſerved whether there be any increaſe or augmentation of heat, as there is in the Sun-beams.

6. Let a Burning-Glaſs alſo be tried with a common flame.

One Negative to the third Affirmative Inſtance.

There is no manifeſt or conſtant effect found in Comets, (if ſo be they alſo may be reckoned amongſt Meteors) for the increaſing the heat of the Weather according to the ſeaſon of the year; though drought have commonly been obſerved to follow. Alſo bright beams and columns, openings of the Element, and the like, are more commonly ſeen in Winter than in Summer, eſpecially in extream cold weather, ſo it be joyned with Drought. But Thunders and flaſhes of Lightning do ſeldome happen in Winter, but onely in time of great heat. But thoſe (which we call) falling or ſhooting ſtars, are commonly thought to conſiſt rather of ſome bright viſions or ſlimie matter, ſet on fire, than of any ſtronger fiery Nature. But of this we will enquire further.

To the fourth one.

There are ſome Coruſcations which yield light, but do not burn: And thoſe are always without Thunder.

To

To the fifth one.

Eructations, and breakings out of flames happen in cold Countries as well as in hot, in *Iſland* and *Greenland:* as alſo trees growing in cold Countries are ſometimes more apt to take fire, and have more Pitch and Rozen in them than thoſe which grow in hot Countries, as Fir and Pinetrees, and the like. But in what ſituation and nature of ſoil ſuch breakings out uſe to be, that we might adde a Negative to the Affirmative, is not yet ſufficiently enquired.

To the ſixth one.

All manner of flame is perpetually hot, either more or leſs, neither can there any Negative be added. And yet it is reported, that which they call *Ignis Fatuus*, which alſo ſometimes hits againſt a wall, hath not much heat in it; peradventure like the flame of ſpirit of Wine, or Aqua-vitæ, which is not fierce or ſcorching. Yet that ſeems to be yet a milder flame which we read of in ſome grave and credible Hiſtories, that hath been ſeen to appear about the heads and hair of young boys, and maidens, which fire no way burned their hair, but ſoftly ſeemed to flame and play about it. And it is certain, that in a night horſes have been ſeen, when they ſwet with travail, to have a certain kind of lightning flaſhes upon them, without any manifeſt ſcorching heat. And not many years ſince was ſeen, and held for a kind of Miracle, a childs Apron, which being a little ſtirred and rubbed, flaſhed out with fire, and ſparkles flew out of it, which might happen peradventure, by reaſon of the Salt or Allom wherewith the Apron was Dyed, which might ſtick upon the Apron in Scales, which with violent rubbing might be broken. And it is moſt certain that all manner of Sugar, either Candid or otherwiſe (ſo it be hard) broken or ſcraped in the dark will ſhine and ſparkle. Likewiſe ſea-water violently ſtirred up with Oars, will give a light, and ſeem to burn, which kind of burning or light the Spaniards call the Sea-lungs. But what kind of heat that fire or flame yields which ſea-men in ancient times were wont to call *Caſtor* and *Pollux*, and now in our days is called St. *Anthonies* fire, is not yet certainly found out.

To the ſeventh one.

Whatſoever is fiery, and turned into red heat, though it be without flame, yet it is perpetually hot; neither can there be any negative added to this affirmative. Yet there are ſome things which ſeem to be ſomewhat near thereunto: as rotten wood which ſhines in the night, and yet doth not feel hot: and the ſcales of rotten fiſh, which alſo gliſter in the dark, yet ſeem not hot, if you feel them; neither can there be any heat perceived in handling a Glow-worm which ſhineth ſo bright in the dark.

To the eighth one.

It is not yet throughly enquired concerning hot Baths, in what ſituation and kind of Soil they ſpring out; therefore there is no Negative added.

To the ninth one.

To liquid boiling or hot things is added a Negative of the liquid thing it ſelf in its own Nature. For there is not any tangible liquid thing, which in its own nature is, and conſtantly endures and remains hot: but heat is only cauſed in it, as an additional, and acquired nature; and thoſe things which in power and operation are very hot, as the ſpirits of Wine, Chymical Aromatick Oils, Oils of Vitriol and Sulphur, and the like; which after a little continuance will burn, yet at the firſt touching they are cold. The Water of hot Natural Baths taken up in Veſſels and ſevered from its ſprings will grow cold as well as water heated at the fire. Oily bodies indeed are not altogether ſo cold to be touched as watry bodies are, and ſilk is not ſo cold as linnen. But theſe things belong to the Table of Degrees of cold.

To the Tenth one.

1. To a hot or fervent vapour, is added the Negative of the Nature of the Vapour it ſelf, ſuch as we find it. For Exhalations out of Oily things though they be eaſily inflamed, yet they are not found to be hot, unleſs they be newly exhaled from a hot body.

2. Likewiſe to a hot fervent Air is added a Negative of the Nature of the Air it ſelf. For we do not find any air to be hot, unleſs it be ſhut up, or chafed, or palpably heated by the Sun, or by fire, or ſome other hot body.

To the eleventh one.

There is a Negative added of weather, which is colder than it ſhould be at that ſeaſon of the year, which happeneth upon a South-Eaſt or North-Eaſt winds blowing; as alſo contrary weathers happen, when a South or Weſt South-Weſt wind bloweth. There is likewiſe an inclination to rain (eſpecially in Winter) when it is mild weather, and to froſt in ſharp cold weather.

To the Twelfth one.

There is a Negative added concerning Air incloſed in Caves in the ſummer time; But there muſt be a more diligent Inquiſition made of incloſed Air. For firſt it is a Queſtion (and that not without cauſe) what the Nature of the Air is of it ſelf, concerng in heat and cold. For the Air doth manifeſtly receive heat from Celeſtial Impreſſions, and cold, peradventure, by the expiration of the earth; and again, in that which is called the middle Region of the Air, from cold vapours and ſnow: ſo that no judgement can be given of the Nature of the Air, by that air which lies open and abroad; but a truer judgment may be given by that which is incloſed and ſhut up. And again, that air ſhould be incloſed and ſhut up in ſuch a veſſel or ſubſtance, which may not of it ſelf qualifie the air, either with heat or cold; nor eaſily admit the force of the air which is without it. Let trial therefore be made with an earthen Pitcher, covered all over with double Leather to ſafegard it from the outward air; keeping in the included air in ſuch a veſſel well cloſed for the ſpace of three or four dayes;

and the trial thereof after the opening of the veſſel may be made, either by the feeling it with the hand, or by a Glaſs of Degrees, called a Weather-glaſs, well and orderly applyed.

To the thirteenth one.

It is likewiſe a Queſtion, whether tepidity, or lukewarmneſs in wool, skins, feathers, and the like, be by reaſon of ſome ſmall inherent heat, becauſe they are taken off from living creatures; or by reaſon of a certain fatneſs, and oilineſs, which is of a Nature agreeing with tepidity; or meerly by reaſon of the concluſion and fraction of the Air, as was ſpoken in the precedent Article; for all Air which is cut off from the continuation of the outward air, ſeems to have ſome tepidity or luke-warmneſs in it. Let therefore trial of this be made in thready Stuffs which are made of Linnen, and not of Feathers, Wool or Silk, which are taken from living Creatures. It is alſo to be noted, that all manner of Duſts, or Pulverized things (in which Air is manifeſtly included) are leſs cold than the bodies of them: as we alſo hold all manner of ſcum or froth, (by reaſon that it contains air) to be leſs cold than the liquor it ſelf.

To the fourteenth one.

To this there is no Negative added: For there is not any thing either Tangible or Spirital, but will heat if it be ſet to the fire: Yet there is this difference, that ſome things will heat ſooner, as Air, Oil, and Water; and ſome will be longer a heating, as Stone and Metals. But this belongs to the table of Degrees.

To the fifteenth one.

To this Inſtance there is no other Negative added, but that it is carefully to be obſerved, that no ſparkles can be drawn out of a Flint, or out of Steel, or any other hard ſubſtance; but there are ſome parcels of the ſubſtance it ſelf beaten off, either of the ſtone or Mettall; and that the attrition of the aire it ſelf can never produce or engender any ſparkles, as it is commonly believed. And thoſe very ſparkles, by reaſon of the weight of the fired body, do tend downward rather than upward, and at their going out do turn to a kind of bodily ſoot.

To the ſixteenth one.

We hold there can be no Negative added to this inſtance: For there is not any Tangible body to be found that will not manifeſtly heat with attrition or violent rubbing. So that the Ancients did dream that there was no other heating power or vertue in heavenly things, but by reaſon of the attrition or chafing of the air through a violent wheeling about. But concerning this, or in this kind, we muſt enquire further, whether ſuch bodies or ſubſtances as are ſhot out of Engines (as Bullets out of Guns) do not receive ſome degree of heat from the percuſſion or blow it ſelf, ſo that we find them ſomewhat hot after they fall. But the air being mov'd rather cools than heats: as we find in winds, and in a pair of Bellows, and the breath of a mans mouth drawn up together. But this motion is not ſo violent as to excite heat: and it muſt be done without intermiſſion and not by parcels, ſo that it is no marvail, if it does not cauſe any heat.

To the ſeventeenth one.

There muſt be a more diligent Inquiry made about this Inſtance; for green and moiſt Herbs and Vegetables ſeem to have ſome occult or hidden heat within them. But that heat is ſo ſmall and weak, that it cannot be felt in each ſeveral one; but being laid and ſhut up together, ſo that their ſpirit cannot breath out into air, but feedeth and nouriſheth each others; then there ariſeth a manifeſt heat, and ſometimes a flame, when the matter is fitting for it.

To the eighteenth one.

Alſo concerning this Inſtance there muſt be a more diligent Enquiry made. For quick or unſlackt Lime ſeems to take heat by having water thrown upon it, either by the union of the heat which before was diſtracted, (as we ſaid before of Herbs laid up cloſe together) or by the irritation and exaſperation of the fiery ſpirit by the Water, there being ſome conflict and antiperiſtaſis between them. Now which of thoſe two things may be the cauſe will more eaſily appear, if there be Oil thrown on inſtead of water: For the Oil will ſerve as well for the uniting of the incloſed ſpirit, though not for the irritation or provoking of it. Alſo there muſt be a larger experiment or trial made as well in aſhes and lines of divers bodies, as by the putting in of divers ſorts of liquors.

To the nineteenth one.

To this Inſtance is added the Negative of other Metals, which are more ſoft and fluid: For thin leaves of gold diſſolved into liquor with the Royal water, yield no palpable heat in their diſſolving; nor Lead in Aqua-fortis; nor yet Quick-ſilver, (as far as I can remember) but ſilver doth excite a little heat, and Copper, as I remember, but Pewter doth it more manifeſtly, and moſt Iron and Steel, which in their diſſolution cauſe not only a ſtrong heat, but alſo a violent kind of boyling: So that the heat ſeems to be cauſed by the conflict when the ſtrong waters do pierce and rent in ſunder the parts of the body. But where there is leſs reſiſtance in the bodies, and that they eaſilier yield, there is hardly any heat excited.

To the twentieth one.

There is no Negative to be added to the heat of creatures, unleſs it be of Inſects, by reaſon of the ſmalneſs of their bodies: For in Fiſhes compared with earthly Creatures, there is rather to be noted a degree of heat, than a privation. In Vegitables and Plants there is no degree of heat to be perceived in the feeling of them, nor in their gums, nor in their very Marrows being opened. But in Animal Creatures there is a great diverſity of heat to be found, as well in their parts, (for one is the heat about the heart, another in the brain, another about the external parts) as in their accidents, as in their vehement exercitation, and Feavers.

To the one and twentieth one.

To this Inſtance there is ſcarce any Negative to be added: For the Excrements of Beaſts, even after they are old and long ejected, manifeſtly have ſome potential heat in them, as may be perceived by their fattening of the ground.

To the two and twentieth one.

All manner of liquors which have a great and ſtrong acrimony in them (be they either Waters or Oils) do execute the operations of heat in the rending in ſunder or divulſion of bodies, and the aduſtion or burning of them after ſome continuance; yet at the firſt touching of them there can be no heat perceived. And they operate according to the analogie and pores of the body to which they are applyed. *Aqua Regis* diſſolves Gold, but not Silver: And contrariwiſe *Aqua fortis* diſſolves Silver, but not Gold, and neither of both theſe waters will diſſolve Glaſs: and ſo of others.

To the four and twentieth one.

Let there be a trial of the ſpirit of Wine, made in wood, or Butter, Wax, or Pitch, and ſee if it will any way melt any of them with its heat. For the four and twentieth Inſtance ſheweth an imitative power of heat in it in incruſtations or hardnings. So let there trial be made alſo in Liquefactions or Meltings. Let there alſo be a trial made, or Experience tried by a Glaſs of Degrees, or a Weather-glaſs, and let it have an outward hollow place at the top, and put ſpirit of Wine well rectified into that outward hollow place, and let the hollow place be covered, that it may the better contain the heat; and let it be obſerved whether by its heat it will cauſe the water to deſcend.

To the five and twentieth one.

Drugs and Herbs which are ſharp and biting upon the Palate, much more being taken inward, are perceived to be hot: Let us therefore ſee upon what other Materials they do execute the works and operations of heat. Sea-men do report, that when heaps and great maſſes of Drugs or Spices which have been long ſhut and heaped up together, are opened on a ſuddain; they who turn them or take them out firſt, are in great danger of Feavers and Inflamations of their ſpirits. Likewiſe there may be trial made, whether the Powders of ſuch Drugs or Herbs will dry Lard, or other fleſh hanged over them, as the ſmoak of fire will.

To the ſix and twentieth one.

Acrimony or Penetration is as well in cold things, as Vinegar, and Oil of Vitriol, as in hot things, as Oil of Origanum, or the like. And ſo likewiſe in Animate things they cauſe pain and ſmart, and in inanimate things they pull in ſunder the parts and conſume them: neither is there any Negative added to this Inſtance: And in animate or living things, there is never any pain, but is accompanied with ſome kind of heat.

To

To the ſeven and twentieth one.

Many are the actions and operations which are common both to heat and cold, though in a diverſe way. For Snow ſeems a while after the handling of it,to burn childrens hands: and cold keeps fleſh from putrefaction as well as fire; and heat contracts bodies and makes them leſs, and ſo doth cold. But it is better to leave theſe and the like things till we come to enquire of cold.

The third Aphoriſm.

THirdly, there is apparance to be made before underſtanding of Inſtances, in which Nature (of which Inquiry is made) is according to more or leſs, either making compariſon of the increaſe and decreaſe in the ſame ſubject, or making compariſon the one with the other in divers ſubjects. For the form of a thing,being the very thing it ſelf,and the thing not differing from the form otherwiſe than Apparancy and Exiſtency, or Outward, and Inward do differ, as well in order to man, as to the Univerſe; It therefore neceſſarily followeth, that no Nature muſt be taken for a true form,unleſs it continually decreaſe when Nature it ſelf decreaſeth: and likewiſe continually increaſeth when Nature it ſelf is increaſed. And this Table we commonly call the Table of Degrees or Table of Comparative.

The Table of Degrees or Comparatives in Heat.

WE will firſt ſpeak of thoſe things in which there is no Degree at all of Heat, but ſeem only to have a kind of a Potential heat, or a diſpoſition or preparation to heat. Then we will deſcend to thoſe things which are indeed actually and palpably hot to the touch, and of their ſtrength and degrees.

1. In ſolid and tangible bodies there is not any thing that of its own Nature is originally hot: For there is no ſtone, no metal, no ſulphur, nothing that may be digged up; no wood, no water, no carkaſs of a beaſt that is hot. And the hot waters of Baths ſeem to gain their heat by ſome chance or accident, either by ſome fire or flame within the earth, ſuch as we ſee is caſt out of Mount *Ætna*, and other hills; or by the conflict and ſtrife of bodies, as we ſee a certain heat excited in the diſſolving of Iron, and Pewter, ſo that there is no degree at all of heat in things inanimate which can be felt by man: yet they differ in degrees of coldneſs, for wood is not ſo cold as Metal. But this belongs to the Table of degrees in coldneſs.

2. Yet many inanimate things are very much diſpoſed to Potential heats,and preparations to flame,as Sulphur,Marle,and Salt Peter.

3. Thoſe things which before were hot, as Horſe-dung or Lime, or peradventure Aſhes, or Soot, do retain certain hidden Relicks of their firſt heat, ſo that certain diſtillations and ſeparations may be cauſed in ſome things by burying them in Horſe-dung; and heat is excited in Lime by caſting water upon it, as we ſaid before.

4. Amongſt Vegetables there is not any Plant, or part thereof (as the Gum or Marrow) that ſeems hot being touched; But (as we ſaid before) green Herbs laid up cloſe together do heat. And ſo the inward feeling,

as that of the Palate, and Stomack; yea, and to the outward feeling alſo after they have been applyed for a while (as in Plaiſters and ointments) ſome Vegetables are hot, and ſome cold.

5. There is no part of any Beaſt after it is dead, or ſevered from the reſt of the body, wherein man can feel any heat: For horſe-dung it ſelf retains no heat in it, unleſs it be cloſe laid up or buried. Yet all manner of dung ſeems to have a Potential kind of heat, as appears by its fattening and enriching of ſoil. And likewiſe the carkaſſes of living things have ſuch a kind of hidden and Potential heat: So that in Church-yards, where people are buried dayly, the earth gathers a kind of occulted and hidden heat, which will ſooner conſume a body that is laid in it, than another pure earth. And amongſt the Indians (as it is reported) they have a certain kind of thin and ſoft web made of Birds Feathers, which hath a kind of in-bred force, by which it will diſſolve and melt Butter that is wrapped up in it.

6. All things that are of force to fatten and enrich ſoil, as Dung of all ſorts, Chalk, Sea-ſand, Salt, and the like, have a kind of diſpoſition to heat.

7. Every Putrefaction hath in it ſelf the beginnings or grounds of ſome ſmall heat, though it cannot be perceived by the ſenſe of feeling: For even thoſe things which putrified turn to Maggots, as Fleſh and Cheeſe, ſeem not hot when you touch them; neither doth that rotten wood which ſhineth and gliſtereth in the dark, feel hot. But there is a kind of heat in putrified things, which ſometime betrays it ſelf by the ſmell.

8. Therefore the firſt degree of heat, which by the ſence of feeling is perceived to be hot, ſeems to be the heat of living things, which hath a great extent of degrees: for the loweſt degree which is in Inſects, is ſcarce to be felt, and the higheſt degree will hardly reach to that degree of heat which is in the Sun-beams, in hotteſt Countries and ſeaſons: neither is it ſo ſharp and vehement, but that you may endure your hand on it. And yet it is reported of *Conſtantius*, and ſome others, who were of an exceeding dry conſtitution of body, that being taken with a burning Feaver, they were ſo hot that you could not endure to hold your hand upon them.

9. Living Creatures have their heat increaſed in them, by Motion and exerciſe, by Wine and high food, venery, burning Feavers, and pain.

10. Living Creatures in Feavers which have intermiſſion, in the beginning of their fits are taken with a chillineſs and cold; and a while after they grow extream hot, which they likewiſe do in burning Agues aud Peſtilent Feavers.

11. Let further Enquiry be made of the Comparative heat in divers Creatures, as Fiſhes, four-footed Beaſts, Serpents, Birds, and likewiſe according to their ſeveral and ſpecial kinds, as in a Lion, a Kite, a Man. For according to the common opinion, the Inwards of Fiſhes are not very hot, but the Entrails of Birds are extream hot, as Pigeons, Hawks, and Eſtridges.

12. Let there alſo further enquiry be made of the Comparative heat in the ſame Creature, according to the diverſity of its parts and members. For Milk, Bloud, Seed, Eggs, are found in a mean degree lukewarm, and leſs hot than the outward fleſh of a Creature, when it moves or is driven. But what degree of Heat is in the brain, ſtomack, heart, and the reſt, hath not likewiſe been enquired of.

13. All manner of Creatures, in winter, and cold weather are outwardly cold, but their inward parts are thought to be the hotter thereby.

14. The Heat of the Heaven of Element, in the hotteſt Countries and ſeaſons is not ſo in high a degree as to burn dry wood, or ſtraw, or light tinder which is made of Linnen, unleſſe it be corroborated by the help of a burning-glaſs; and yet it may draw up vapours out of moiſt things.

15. According to the relation of Aſtronomers, there are ſome ſtars hotter than other ſome. And amongſt the Planets, next to *Sol*, *Mars* is the hotteſt, then *Jupiter*, and then *Venus*. *Luna* is cold, and *Saturn* coldeſt of all. Amongſt the fixed ſtars, the hotteſt is that called *Sirius*, then the Lions heart, or *Regulus*, then the Dog-ſtar, &c.

16. The Sun caſts moſt heat when it groweth neareſt its perpendicular or Zenith; which is likewiſe ſo in other Planets, according to their portion of heat. As for example, *Jupiter* heats us more when he is in *Cancer*, or *Leo*, than when he is in *Capricornius* or *Aquarius*.

17. The Sun and the reſt of the Planets do heat more when they are in their *Perigæons*, by reaſon of their nearneſs to the earth, than in their *Apogæons*. And if it happen at any time the Sun to be in his *Perigæon*, and withal near his Perpendicularity, it muſt needs heat more than when it is in its *Perigæon*, but more in obliquity. So that the Compariſon of the Exaltation of the Planets ought to be noted whether it participate more of Obliquity or Perpendicularity; according to the variety of Regions.

18. *Sol*, and likewiſe the reſt of the Planets, are thought to yield a greater heat when they are neareſt to the greateſt fixed ſtars: as when *Sol* is in *Leo*, it is nearer *Cor Leonis*, *Cauda Leonis*, and *Spica Virginis*, and and *Sirius*, and *Canicula*, than when it is in *Cancer*, where notwithſtanding it is neareſt its Perpendicularity. And it is credible that the parts of the Heavens do infuſe the greater heat, (htough it be not perceptible to the feeling) the more they are adorned with ſtars, eſpecially of the biggeſt kind.

19. The Heat of the Heavens is therefore increaſed three ways. By the Perpendicularity, the Propinquity or Perigæon, and by the Conjunction or Conſorting of Stars.

20. Howſoever there is a great difference between the heat of living Creatures, of Celeſtial beams (as they come to us) and flame, though it be never ſo weak, and all things heated with fire, and liquid things, or the air it ſelf being much heated by fire. For the flame of ſpirit of Wine, eſpecially if it be rarified, and not thruſt up together; yet is of force to burn ſtraw, or linnen, or paper, which the heat of a Creature can never do, nor yet the heat of the Sun, without the help of a burning-Glaſs.

21. Beſides, in flames, and fired things there are many degrees in the violence or weakneſs of heat. But of theſe there hath been no diligent Inquiſition: ſo that we muſt of neceſſity lightly run them over. Of flames therefore that of the ſpirit of wine ſeems to be the ſofteſt, unleſs that which they call *Ignis fatuus*, and thoſe flaſhes which are cauſed by the ſweat of beaſts be ſofter. Next is the flame of porous Vegitables; as ſtraw, ruſhes, drie leaves, from which the flame of hair, or feathers doth not much differ. Next unto this is the flame of wood, eſpecially ſuch wood as hath not much rozen or pitch in it, and the flame of ſmall wood (ſuch as commonly is made up in Faggots) is ſofter than that of great

logs,and timber,and roots of trees : a trial whereof may be made in Iron Furnaces, in which Faggots made of boughs of trees,are no way uſeful: Next to this (as we conceive) is the flame of Oil, Tallow and Wax, and ſuch Oily and fat things which have not much acrimony in them ; but the ſtrongeſt heat is in Pitch and Rozen ; and more fervent in Sulphur and Camphire, and Marle, and Salt-Peter,and Salts, (after the crude or raw matter is broken out) and in the compounds of theſe, as Gun-powder and Greek-fire, (which is commonly called Wild-fire) and ſeveral kinds of it, which have ſuch an obſtinate heat, that water will hardly put it out.

22. We alſo hold the flame which proceeds out of ſome imperfect Metals to be very ſtrong and ſharp : But of all theſe things we muſt enquire further.

23. But the flame of fierce and ſtrong Lightnings ſeems to exceed all theſe: For it hath ſometimes melted perfect Iron into drops, which none of thoſe other flames could do.

24. In fired things alſo there are divers degrees of heat, of which alſo there hath been no diligent Inquiſition made. We hold a moſt weak heat to be in burned Linnen, ſuch as we uſe to kindle fire with, and likewiſe that of ſpungy wood, or dryed Match, ſuch as is uſed to fire Guns withal. Next unto theſe comes a burning wood-coal, or Charcoal, and firy hot bricks, and the like. But of all fired things we hold firy Metals to be the moſt vehement hot,as Iron and Copper,*&c.* But of theſe there muſt be further Inquiſition made.

25. There are ſome fired things far better than ſome flames. For fired or red hot Iron is far hotter and more burning than the flame of the ſpirit of wine.

26. There are alſo ſome things which are not fired, but only heated with fire and air ſhut up in Reverberatories. Some do much exceed in heat doth flames and fired things.

27. Motion increaſeth heat, as we may find by experience in bellows and blowing : ſo that ſome of the hardeſt kind of Metals will not diſſolve or melt with a dead fire, without it be blown up.

28. Let trial be made by burning-glaſſes, with which,as I remember,this may be done. As for example, if the Glaſs be ſet at the diſtance of a ſpan from the combuſtible object,it will not light nor burn ſo well as if it be ſet (as for example) at the diſtance of half a ſpan length, and ſo ſoftly and by degrees be drawn to the diſtance of a whole ſpan length : yet the Angles and union of the beams is the ſame, but the Motion it ſelf increaſeth the operation of the heat.

29. It is that thoſe burnings which happen when it is a ſtrong wind do proceed further when they are againſt the wind than with the wind, namely, becauſe the flame beats back with a quicker motion when the wind ſends it back, than when the wind drives it forward.

30. Flame doth not break out, or engender,unleſs there be ſome Concavity in which the flame may move and play, unleſs it be in flatuous and windy flames of Gun-powder and the like, where the compreſſion and impriſoning of the flame increaſeth the fury of it.

31. An Anvil is much heated by the hammer ; ſo that if the Anvil were of a thin plate, we believe it might be heated by ſtrong and continual blows of the Hammer, ſo far as to be red hot, as if it had been put in the fire. But this may be made trial of.

32. But in ſuch fired things which are porous, and give ſpace and way for the exerciſing of the Motion of the fire, if that Motion be hindered by a ſtrong compreſſion ; the fire is preſently put out, as when tinder, or a burning ſnuff of a Candle or Lamp is preſſed or trodden out, preſently the operations of the fire do ceaſe.

33. The approaching or ſetting near of a thing to a hot body, increaſeth the heat, according to the degree of approaching; and the ſame effect is in light. For the nearer the object is ſet to the light, the more viſible it is.

34. The union of divers heats increaſeth the heat. For a great fire and a little fire in the ſame place, do ſomewhat one with the other increaſe the heat: But lukewarm water put into boyling water cools it.

35. The remaining or long ſtaying in a place of a hot body increaſeth the heat. For the heat continually proceeding and iſſuing out, is mixed with the heat which was there before; ſo that it multiplyeth the heat. For a fire will not heat a Chamber ſo much in half an hour as it will do in a whole hour. But it is not ſo in light; for a Lamp or a Candle ſet in a place, will give no more light after a long ſtay, than it did at the very firſt.

36. An irritation or exaſperation by the coldneſs which is round about, increaſeth the heat, as we find by fire in froſty weather: which we believe to be done, not only by the keeping in, and contracting of the heat, which is a kind of uniting it; but alſo by exaſperation: as when Air, or a ſtick is violently drawn together, it doth not flie out again punctually into its proper place, but goes further the contrary way. So let there be a diligent trial made, by a ſtick, or ſome ſuch thing thruſt into the flame, whether it doth not burn ſooner thruſt on the one ſide of the flame, than if it be thruſt into the middle of it.

37. The degrees of taking in, or receiving of heat are many. And firſt of all you muſt note how ſmall and little a heat will alter, and in ſome meaſure heat even ſuch things as are leaſt fit to take heat. For a Bullet of Lead, or any other metal will be ſomewhat heated by holding it for ſome time in a mans hand; ſo eaſily is heat excited, and tranſmitted into any thing, the body being no way apparently changed.

38. Of all bodies air doth moſt eaſily take, and ſend back heat, which may be eaſilieſt perceived in the Weatherglaſſes. They are made in this kind: Take a glaſs with a hollow belly, and a long and ſmall neck; let this glaſs be turned topſie turvie, the mouth downward, and the belly upward, and ſo let it be put into another glaſſe where there is water, touching the bottome of the receiving-glaſſe, with the mouth of the glaſs which is put in. And let the neck of the glaſs which is put, lean a little upon the mouth of the receiving-glaſs, which that it may the better do, let a little wax be laid about the mouth of the lower glaſs; but the Mouth muſt not be quite ſtopped, for fear leſt for want of ſucceeding Air, the Motion which we ſhall preſently ſpeak, be hindred, which is very delicate and eaſie. But the glaſs which is put in muſt firſt have the top of it, which is the belly, warmed. Then after the glaſs is placed, as we have ſaid, the Air will retreat and draw it ſelf up together, (which before was dilated, and ſpread abroad by heating) after a ſufficient pauſe, to quench that acquired heat to ſuch an extent and dimenſion as the air at that time ſhall be when the glaſs is put in, and the water ſhall be drawn up to ſuch a meaſure: And there muſt be a long and narrow paper hanged

about it, and marked out with as many degrees as you ſhall think fitting. And you ſhall ſee as the time of the day grows hot or cold, that the Air will contract it ſelf into the leſſe compaſs by reaſon of cold, and extend and dilate it ſelf by reaſon of heat, which ſhall be perceived by the water aſcending when the Air cloſes up together, and deſcending when the air dilates or ſpreads it ſelf abroad. And the ſence of the air concerning heat and cold is ſo ſubtile and exquiſite, that it goes far beyond the faculty of mans feeling: ſo that a Sun beam, or the heat of ones breath, and much more the heat of ones hand, it being laid a top of the glaſs will manifeſtly cauſe the water to deſcend. But we believe that the ſpirit of Beaſts hath yet a more exquiſite feeling of heat and cold, if it were not hindred and dulled by the maſs of the body.

39. Next to the Air we believe thoſe bodies to be moſt ſenſible of heat, which are moſt immediately changed and altered from cold, as ſnow and Ice; for they begin to melt and be diſſolved with the leaſt heat and luke-warmneſs. Next to them peradventure is Quick ſilver. Next unto it are your fat bodies, or ſubſtances, as Oil, Butter, and the like; then Wood, then Water, and laſt of all Stons and Metals, which do not eaſily grow hot, eſpecially inwardly, But theſe being once hot, do retain their heat for a long time; ſo that a Brick or a ſtone, or a hot Iron being put into a tub of water for a quarter of an hours ſpace, more or leſs, will hold and keep their heat, ſo that you ſhall hardly be able to touch them.

40. The leſſer the maſs of the body is, the ſooner it heats, a hot body being laid near to it; which ſheweth that all manner of heat with us, is in ſome manner adverſe and contrary to any tangible body.

41. Heat, as concerning the humane ſenſe of feeling, is a various and reſpective thing: ſo that if we put our hand when it is cold into luke-warm water, the water will ſeem hot; if our hand be hot, the ſame water will ſeem cold.

The fourth Aphoriſm.

HOw poor we are in Hiſtory every one may eaſily perceive, by that in the precedent Tables: We have been forced not onely to inſert Traditions and relations inſtead of Hiſtory, making ſome queſtion and doubt of the Truth and Authority of them; but we have alſo oftentimes been conſtrained to make uſe of theſe or the like words: Let trial be made; or, let it be further enquired.

The fifth Aphoriſm.

ANd we uſe to call the work and office of theſe three Tables, the appearance of the Inſtances to the underſtanding: and the appearance being made, the Induction it ſelf is to be ſet a work. For upon the appearances of all and every Inſtance, ſuch a Nature as may always be preſent or abſent, may increaſe or decreaſe with the Nature which is propoſed; and ſhall be, as we ſaid before, a limitation of common Nature. This if the mind do at firſt and from the beginning attempt to do affirmatively (which being left to it ſelf it always uſeth to do) we ſhall find ill determined notionals, phantaſms, and imaginary things, and Axioms daily to be amended; unleſs we will (according to the cuſtome of the Schools) fight for falſehoods. And yet they will queſtionleſs be either better or worſe according to the faculty and ſtrength of the underſtanding which operates. To God (who is the giver and Maker of forms) or peradventure to Angels, and Underſtandings it may belong to know Forms immediately by way of affirmation, and in the beginning of Contemplation: But it is a thing indeed beyond mans capacity, who can at firſt proceed onely by Negatives, and at the laſt end with Affirmatives, after all manner of excluſion.

The ſixth Aphoriſm.

THere muſt therefore a ſolution and ſeparation of Nature be made; not by Fire, but by the Mind, as by a divine fire. Therefore the firſt work of a true Induction is (as concerning finding out of Forms) a Rejection or Excluſion of all, and ſingular ſuch Natures which are not found in any Inſtance where the ſuppoſed Nature is preſent; or that are found in any Inſtance where the ſuppoſed Nature is abſent; or that are found to increaſe in any Inſtance when the ſuppoſed Nature decreaſeth, or to decreaſe when the ſuppoſed Nature increaſeth. And then after the Rejection and Excluſion is rightly and duly made, in the ſecond place (as in the bottom) will remain (all volatile opinions flying up into ſmoak) the ſolid, true, and well terminated Affirmative Form. And this is brief and eaſie to be ſpoken; but we muſt attain to it by many windings and circumſtances: And peradventure we ſhall not omit any thing that ſhall make to this purpoſe.

The ſeventh Aphoriſm.

BUt we muſt continually take heed and beware, leſt while we ſeem to attribute ſo many parts to Forms, the things we ſpeak be wreſted to thoſe Forms to which mens thoughts and contemplations have hitherto been accuſtomed. For in the firſt place we do not now ſpeak of copulated Forms, which are (as we ſaid before) the marriages or conjunctions of ſimple Natures by the common courſe of the Univerſe, as of the Lion, Eagle, Roſe, Gold, and the like. For it will be time to treat of them when we ſhall come to the hidden Progreſſions, and hidden Figurations, and the finding out of them, as they are to be found in ſubſtances (as they call them) or concrete Natures. And again, thoſe things which we ſpeak muſt not be underſtood, (alſo as concerning ſimple Natures) of abſtracted Forms and Ideas, either not dermined or ill determined in the matter. For when we ſpeak of Forms, we mean nothing elſe but thoſe Laws and determinations of a pure act which do order and conſtitute ſome ſimple Nature, as heat, light, weight in any ſuſceptible matter and ſubject: So that the Form of Heat, or the Form of Light, is the ſame thing as the Law of heat, or the Law of Light: neither do we ever withdraw our ſelves, or recede from the things themſelves, and the operative part. Therefore when we ſay (as for example) in the Inquiſition of the Form of heat; Reject tenuity, or tenuity is not of the Form of Heat, it is as much as if we ſaid, a man may bring in heat upon a condenſed or ſolid body; or contrariwiſe, a man may take, or put away heat from a thin and tenuous body. And if to any one it ſeems that our Forms alſo have ſomething of the Abſtract becauſe they mix and joyn together Heterogeneal, als; (for the heat of heavenly things and fire ſeem to be very Heterogeneal; the redneſs which is fixed in the roſe or the like, and that redneſs which is the Rain-bow, or the luſter of an Opall, or a Diamond; Death by drowning, Burning, by a prick of a Sword, by an Apoplexy, and by Conſumption, and theſe do agree in the Nature of Heat, Redneſs, Death,) let him know that he hath an underſtanding captivated and kept in by cuſtome, integrality of things, and by opinions. For it is moſt certain, that theſe things, though they be Heterogeneal and Alien, yet they agree in the Form, or Law, which ordains Heat, Redneſs, or Death. And that humane power cannot be emancipated and freed from the common courſe of Nature, and be enlarged and exalted to new Efficients, and new ways and means of operating, but onely by revealing and inventing of ſuch Forms. And yet after this union of Nature, which is the moſt principal thing, we will afterward, in its proper place, ſpeak of the diviſions and veins of Nature, as well ordinary, as thoſe which are internal, and moſt true.

The eighth Aphoriſm.

NOw we muſt propoſe an Example of the Excluſion or Rejection of Natures, which by the Tables of Appearance are found to be not of the Form of Heat; Giving you in the mean time to underſtand, that not onely each Table is ſufficient for the Rejection of any Nature, but alſo each ſeveral Inſtance contained in them. For it appears plainly by what hath been ſaid, that every contradictory Inſtance doth deſtroy what may be thought of the Form: yet notwithſtanding, for perſpicuities ſake, and to demonſtrate the uſe of the Tables more plainly, we double or repeat the Excluſive.

An Example of the Excluſive, or Rejection of natures from the Form of Heat.

1. BY the Beams of the Sun, Reject the Elementary Nature.

2. By common fire, eſpecially fires under ground (which are moſt remote and ſecluded from the Celeſtial beams) Reject the Celeſtial Nature.

3. By all manner of Calefactions of bodys, (namely Minerals, Vegitables, exterior parts of Animals, or living Creatures, Water, Oil, Air, and the like) only by putting them near to the fire, or any other hot body, Reject all manner of Variety, or more ſubtile texture or compoſure of bodies.

4. By Iron and other metals made red hot, which heat other bodys, and yet are no ways diminiſhed in their weight or ſubſtance; Reject the infuſion or mixture of the ſubſtance of another hot thing.

5. By hot Water, and Air, and alſo by Metals and other ſolid things heated, but not to that degree to be firy, or red hot; Reject Light.

6. By the Rays of the Moon and other Stars, (the Sun only excepted,) Reject alſo Light.

7. By the Compariſon of Red hot Iron, and the flame of the Spirit of Wine (of which the Red hot Iron hath more heat, and leſs light, and the Spirit of Wine more light and leſs heat) Reject Light alſo.

8. By Gold and other Red hot Metals, which are generally of a moſt thick body; Reject Tenuity or Thinneſs.

9. By air, which for the moſt part is cold, and yet remains tenuous and thin. Reject alſo thinneſs or tenuity.

10. By Red hot Iron, which doth not ſwell in the maſs, but remains ſtill within the ſame viſible dimenſion; Reject Local or Expanſive Motion in general.

11. By the dilatation of air in Weather-glaſſes, and the like, which moveth manifeſtly, locally, and expanſively, and yet receives no manifeſt increaſe of heat; Reject alſo Local and Expanſive Motion in general.

12. By the eaſie Tepefaction or making Luke-warm of all manner of bodys without any deſtruction, or notable alteration; Reject the deſtructive Nature, or violent infuſion of any new Nature.

13. By the conſent and conformity of like operations done by Heat and Cold: Reject both Expanſive, and Contractive cold in general.

14. By the kindling of heat by Attrition or violent rubbing together of bodies; Reject the Principal Nature. We call that Principal Nature which is found poſitive in Nature, and is not cauſed by precedent Nature: There are alſo other Natures, for we do not make up perfect Tables, but only ſet down Examples. All and ſingular the former Natures are not of the Form of heat. And man is free of all the foreſaid Natures, in his operation upon heat.

The Ninth Aphoriſm.

IN the Excluſive are laid the grounds and foundations of the true Induction, which notwithſtanding is not perfected until it be ſetled in the Affirmative. Neither is the Excluſive any way perfect, nor cannot be ſo in the beginnings. For the Excluſive is (as it plainly appears) a Rejection of ſimple Natures: and if we yet have not good and true notions of ſimple natures, how can the Excluſive be rectified? But ſome of thoſe which we have ſpoken of (as the notion of the Elementary nature, the notion of the Celeſtial nature, the notion of Tenuity) are wandring notions, that are not well terminated. We therefore who both know and remember what a great work we undertake (namely to make the underſtanding of Man equal to things, and to nature) will no way give over with that which we have already ſpoken; but will carry the matter on further, and are framing and diſtibuting ſtronger helps for the uſe of the underſtanding, which we will now adde. And truly for the interpreting of nature, the mind is to be ſo prepared and framed, that it may hold it ſelf up in the true degrees of Certitude; and yet think (eſpecially in the beginnings) that thoſe things which are preſent, do much depend upon them which after.

The tenth Aphoriſm.

YEt becauſe truth is ſooner gotten out of error than out of confuſion, we think it were fitting to ſuffer the the underſtanding after it hath ſtudied and pondered upon the three Tables of the firſt Appearance (ſuch as we have laid them down) to prepare it ſelf and attempt the work of the Interpretation of nature in the Affirmative, as well out of the Inſtances of the Table, as of thoſe things which ſhall otherwiſe preſent themſelves unto him. Which kind of Trial we uſe to call a Permiſſion of the underſtanding; or a begun Interpretation, or firſt.

The firſt Vindemiation of the Form of Heat.

WE muſt note, that the Form of the thing is (as it plainly appears by what we have ſpoken before) in all and each of thoſe Inſtances, in which the thing it ſelf is, otherwiſe it would not be a Form: So that there can be no contradictorie Inſtance given. Yet the Form is found far more conſpicuous and evident in ſome Inſtances then in otherſome: namely, in ſuch where the nature of Form is leſſe reſtrained, hindred and reduced into order by other Natures: And ſuch Inſtances are called Enlightnings,or Oſtenſive Inſtances. We muſt therefore proceed to the firſt Vindemiation of the Form of Heat. In all and ſingular Inſtances Nature whoſe limitation is heat, ſeems to be a motion, which is moſt plainly ſhewn in Flame, which always moveth, and in boiling or ſeething Liquors, which do continally move. And it likewiſe appears, in the haſtning and increaſe of heat made by Motion, as in Bellows and Winds, whereof ſee Inſtance 29. Table 3. And likewiſe in other kinds of Motion, whereof ſee Inſtance 28. and 31. Table 3. Again it is ſhewn in the extinction of fire and heat by a ſtrong compreſſion, which ſtays and cauſeth Motion to ceaſe: whereof ſee Inſtance 30.and 32. Table 3. It is alſo made manifeſt in this, that any kind of body is deſtroyed, or at leaſt notably altered by any kind of fire, and ſtrong and vehement heat. Whereby it plainly appears, that Heat doth cauſe a tumult and perturbation, and a ſharp Motion in the inward parts of the body, which by little and little inclines to a diſſolution. Let that which we have ſaid of Motion, (namely that it is in place of a Genus to heat) not that heat ingenders Motion, or that Motion ingenders heat (though theſe be true in ſome thing) but that the very ſelf-heat, or the quiddity it ſelf of heat is Motion and nothing elſe, but limited by differences,which we will prepreſently adde,after we have ſet down ſome Cautions to avoid the Equivocation. A thing hot to the ſenſe is a reſpective thing, and in order to man, and not to the univerſal, and it is rightly laid as an effect of heat onely in the Animal ſpirit. And in it ſelf alſo it is a different thing, ſeeing the ſame bodie (according as the ſenſe is prediſpoſed) brings in the perceivance both of heat and cold, as appears by the Inſtance 41. Table 3. Neither muſt the communication of heat or its Tranſitive Nature, by which one body laid to another body that is hot, doth alſo grow hot, be confounded with the form of heat. For heat is one thing, and Calefactive or cauſing of heat is another. For by the Motion of Attrition heat is brought in, without any preceding heat: whereby the Calefactive or cauſer of heat is excluded from the Form of heat. And likewiſe when heat is made by the approximation or drawing near of heat, this is not done out of the Form of heat, but wholly depends upon a higher and more common Nature, namely the Nature of Aſſimilation or Multiplication of it ſelf; whereof muſt be a ſeveral Inquiſition made. But the notion of fire is vulgar, and nothing worth; for it is compoſed of the concourſe or meeting of heat and brightneſs in ſome one body, as in ordinary flame, and bodies heated to the height of being red hot.

Laying therefore all Equivocals aſide, we muſt at laſt come to the true Differences, which limit the Motion, and bring it into the Form of Heat.

THe firſt Difference therefore is, that Heat is an Expanſive Motion, by which the body ſtrives to dilate and ſpread abroad it ſelf, to grow into a greater ſphere or dimenſion than it held at firſt. And this Difference ſhews it ſelf moſt manifeſtly in the flame where the ſmoak or fat breath doth manifeſtly open and dilate it ſelf into flame.

It appears alſo in all boyling liquor, which manifeſtly ſwels, riſes, and bubbles, and forces a way of extending it ſelf, till it turns into a body of greater extent, and more dilatated than the liquor it ſelf: namely, into vapour, or ſmoak, or Air.

It ſhews it ſelf alſo in all manner of wood, or combuſtible thing; wherein ſometimes there is a ſweating, and always an evaporation.

It ſhews it ſelf alſo in the melting of Metals, which (being of a moſt compacted body) do not eaſily ſwell nor dilatate themſelves, and yet their ſpirit after it is dilatated within it ſelf, and conſequently deſires a greater dilatation, it thruſts and plainly drives the thicker parts into the liquid. And if the Heat be encreaſed, and made more violent, it reſolves and turns much of it into volatile.

It ſhews it ſelf alſo in Iron or Stones, which though they do not melt and run, yet they grow ſoft: which appears alſo in wooden rods or ſticks, which being heated in hot Embers, become flexible.

But this Motion is beſt diſcerned in the Air, which by a little heat preſently and manifeſtly dilatates it ſelf, as by Inſtance 38. Table 3.

It ſhews it ſelf alſo in the contrary Nature, namely of cold. For cold doth contract and ſhrink up all bodies; ſo that in extream cold weather nails will fall out of walls, Braſs will crack, and Glaſs alſo being heated and preſently laid in the cold will crack and break. The Air alſo with every ſlight cold will contract it ſelf, as Inſtance 38. Table 3. But of theſe things we will ſpeak more at large in the Inquiſition of cold.

Neither is it to be wondred at, though heat and cold do work many common effects, (whereof ſee Inſtance 32. Table 2.) ſeeing there are two of the following Differences (which we will preſently ſpeak of) which belong unto both Natures: though in this Difference (whereof we now ſpeak) the actions be diametrically oppoſite. For heat gives an Expanſive and Dilatating Motion; And cold gives a Contracting and Shrinking Motion.

THe ſecond Difference is a Modification of the firſt, namely this; That heat is an Expanſive Motion, or a Motion towards the circumference, but with this limitation, that the body muſt withal be carried upwards. For queſtionleſs there are many mixt Motions: as for example, an Arrow or a Dart in going forward wheels about, and wheeling about it goes forward: So likewiſe the Motion of heat is both expanſive and bearing upward.

This Difference plainly appears by putting of a fork or Iron Bar into the fire; for if it be put into the fire perpendicularly, and hold your hand upon it, it will quickly burn your hand, which it will not do ſo ſuddenly if it be put in ſide-way or lower.

It alſo appears by diſtillations in a Deſcending Still, ſuch as are uſed for the tendereſt kind of Flowers, the ſmell whereof eaſily vaniſheth away: Wherein Induſtry hath invented this way to place the fire upon, and not under the Still, to the end that it may ſcortch leſs; for not onely flame, but all manner of heat naturally tends upward.

Let a Trial or Experiment of this be made in the contrary nature of cold, namely, whether cold doth not contract the body deſcending downward, as heat doth dilatate it aſcending upward. Take two Iron rods, or two glaſs Trunks, both of one bigneſs and proportion, and let them be made ſomewhat hot, and lay a ſpunge dipped in cold water, or ſome ſnow under one, and upon the other; And we believe that will ſooner be cold all over which hath the ſnow above it, than that which hath the ſnow beneath it: Contrary to the effect which is wrought by heat.

The third Difference is, that heat is a motion not uniformly Expanſive in all parts, but in ſome leſſer parts of the body; and withal reſtrained, repelled, and reverberated, ſo that it turneth to an alternative, trying, and ſtriving motion, chaſed by the repercuſſion, whence the raging of heat and fire takes it beginning.

And this difference is moſt of all perceived in flame and boyling liquors; which always quake, and ſwell up in ſmall parcels, and then ſink again.

It is ſhewn alſo in thoſe bodies which are ſo hardly compacted together, that being heated or fired, they do not ſwell nor increaſe their bulk or maſs; as red hot Iron, in which is a moſt ſharp heat.

This appears alſo in that, that fire ſcorcheth moſt in cold weather.

Likewiſe it appears by this, that when Air is extended in a Weather-glaſs, without any let or repulſion, that is to ſay, uniformly and equally, the heat is not perceived. Likewiſe in winds which are incloſed and ſhut up, though they break out with a mighty force, yet there is no notable heat perceived; becauſe the Motion is of the whole, and not alternative by parcels. And for this let trial be made, whether flame doth not burn more ſharply toward the ſides than in the middle.

It appears alſo in this, that all manner of burning is performed thorow ſmall pores of the body which is burned; ſo that burning doth undermine, penetrate, dig, and prick, as if there were an infinite ſort of needles. And thence it comes that all ſtrong waters (if they be proportioned to the body upon which they operate) do work and operate like fire, thorow their corroding and piercing Nature.

And this Difference, whereof we now ſpeak, is common to the Nature of cold, in which the contractive Motion is reſtrained by the renitency or oppoſition of expanſion: As in heat the expanſive motion is reſtrained by the retinency or hanging back of contraction.

So that whether the parts of the body do penetrate inwardly, or outwardly, the reaſon is alike; though the ſtrength or force be very unequal and different; for we have not here with us upon the ſuperficies of the earth any thing that is cold in an Extream degree. See Inſtance 27. Table 9.

The fourth Difference is a modification of the firſt; Namely this, that the motion of pricking or penetration, muſt be ſomewhat ſwift, and not ſlow and dull; and that it muſt be done by parcels, though ſmall ones: yet not extream ſmall, but of a mean bigneſs.

This Difference appears in comparing of the operations done by fire with thoſe which are performed by time or age. For age or time dries up, conſumes, ruins, and turns to aſhes as well as fire, or rather more ſubtily. But becauſe ſuch a kind of motion is very ſlow, and is wrought upon very ſmall parcels, the heat is not perceived.

It appears alſo in comparing the diſſolvings of Iron and Gold; for Gold is diſſolved without raiſing any heat, but Iron with a moſt vehement ſtirring up of heat, though for the time, it be almoſt in the ſame quantity. Becauſe that in Gold the ingreſs or entrance of the water of ſeparation is mild, and inſinuates it ſelf ſubtily, and the parts of the Gold do yield eaſily: But in Iron the ingreſs is harſh, and with ſome conflict, and the parts of the Iron ſhew more obſtinacy.

It appears alſo in ſome Gangrenes, and Mortifications of the fleſh; which do not cauſe any great heat or pain, by reaſon of the ſubtilneſs of the Putrefaction.

And let this be the firſt Vindemiation or inchoated interpretation of the Form of heat, made by the permiſſion of the underſtanding.

And by this firſt Vindemiation the Form or true Definition of heat, (namely of that heat which in reſpect of the Univerſal, not only relative to the ſenſe) is in few words this. Heat is an Expanſive Motion, cohibited, and ſtriving by the leſſer parts: and Expanſion is modified, that expanding or ſpreading it ſelf out in circuit, it muſt notwithſtanding incline ſomewhat upward; and that ſtriving by parts is likewiſe modified; that it ought not to be altogether ſlow, but ſomewhat ſwift, and with ſome violence.

And concerning what belongs to the Operative it is the ſame thing; for the Deſignation or Deſcription is this: If in any natural body you can excite a Motion to dilatate and ſpread out it ſelf, and can ſtay back that motion, and ſo turn it againſt it ſelf, that dilatation may not proceed equally, but partly proceed, and partly be beaten back, you will queſtionleſs engender a heat: not any way regarding whether it be an Elementary body, (as they call it) or imbrued by the Celeſtial; whether luminous or dark; whether thin or thick; whether locally ſpread abroad, or contained within the incloſures of the firſt dimenſion; whether tending to diſſolution, or remaining in the ſame ſtate, whether Animal or Vegitable; whether Mineral or Water; whether Oil or Air, or any other ſubſtance whatſoever, ſo it be ſuſceptible of the foreſaid motion. A hot thing to the ſenſe is the ſame, but with ſuch an Analogy as is fitting for the ſenſe.

The Diviſion of Heat.

IT ſeems to be a cuſtomary and authentical diviſion, that there are three kinds of heat; Namely, the heat of Celeſtial things, the heat of Animals, or living creatures, and the heat of fire; and that theſe heats, (eſpecially one of them compared to the other two) are in their eſſence and kind, or their ſpecifical Nature, meerly different, and altogether heterogeneal. For the heat of heavenly and animal things ingenders and cheriſhes; whereas contrarariwiſe the heat of the fire corrupts and deſtroys.

There is therefore an Inſtance of contract, and that is a common trial when we take a branch of a Vine into a room where there is ordinarily a fire, by it Grapes will ripen ſooner than they will abroad, by a month. So that the ripening of fruit even when it hangs upon the tree, may be effected by fire, which ſeems to be a proper work of the Sun. So that from this beginning the underſtanding eaſily raiſeth it ſelf, rejecting the eſſential Heterogeneoſity, to enquire what, or which are thoſe differences which are really and truly found between the heat of the Sun, and that of the fire, from which it proceeds that their operations are ſo diverſe and different, though they themſelves participate in a common nature: which differences we ſhall find to be four. The firſt that the Heat of the Sun, in reſpect of the heat of the Fire, is in degree much ſofter and milder. Secondly, that it is (eſpecially as it is conveyed to us thorow the Air) of a much more moiſt quality. Thirdly, (which is the very chiefeſt of the buſineſs) that it is extreamly unequal, and drawing near and increaſed, and then receding or going back and diminiſhed, which is of no ſmall moment or improvement in the generation of bodies. For *Ariſtotle* did moſt truly affirm, that the principle cauſe of generations and corruptions which are here with us upon the ſuperficies of the earth, is the oblique way of the Sun thorow the Zodiack: whereby the heat of the Sun, partly thorow the viciſſitudes of day and night; partly by the ſucceſſive ſeaſons of winter and ſummer, proves wonderfully unequal: Neither doth this man end there, but preſently ſpoils and makes bad that which he had rightly found out. For as an Arbitrator of Nature, (which is his common practice) he Magiſtrate-like aſſigns the cauſe of Generation to the approach of the Sun, and the cauſe of corruption to the receding and going away of it: When both (namely, the acceſs, or receſs of the Sun) not reſpectively, but in a manner indifferently, yield cauſe as well for Generation as Corruption: foraſmuch as the inequality ſerves onely to the Generation and Corruption of things, and equality to the preſervation of them. There is alſo a fourth Difference between the heat of the Sun, and the heat of the fire, which is of great moment: namely, that the Sun inſinuates its Operations in long ſpaces of time: whereas the Operations of Fire (Mens impatiencies forcing it thereunto) do bring things to an iſſue in a ſhorter time. For if any man ſhall carefully attempt, to temper the heat of the Fire, and reduce it to a more moderate and mild Degree (which may be done many ways) and ſprinkle it, and mix it with ſome moiſtneſs, eſpecially if he imitate the heat of the Sun in its inequality; and laſtly, tolerate or ſuffer delay patiently (not ſuch a delay as ſhall be proportionable to the operations of the Sun, but more than that which men uſe to have in the operations of the Fire) he will quickly lay aſide that Heterogeneoſitie of heat; and either he will, or equal, or in ſome things even exceed the operations of the Sun, by the heat of the Fire. The ſame Inſtance of Covenant is, the reviving of Butter-flies ſtupified and as it were dead thorow Cold, with a little luke-warmneſs of fire: Whereby you may eaſily diſcern, that the Fire may as well vivifie living things, as ripen Vegitables.

Alſo that famous Invention of FRACASTORIUS, of a Frying-panne ſtrongly heated, which Phyſicians hold about the Heads of thoſe who are fallen into a deſperate Apoplexie, which manifeſtly dilatates and extends the Animal Spirits contracted and preſſed together, and almoſt extinguiſhed by Humours and Obſtructions of the Brain, and excites them to Motion even as Fire doth Water or Air, and conſequently vivifieth. Likewiſe Eggs are ſometimes hatched by the Heat of Fire, and many ſuch like things are done; whereby no man can queſtion, or make a doubt, but that the Heat of fire in many ſubjects may be Modified to the Image of Celeſtial and animal Heat.

The Lord FRANCIS BACON of *Verulam* of the ſeveral kinds of Motion.

OR

Of the active Vertue.

Of Divers Kinds of Motion.

LET the firſt Motion be of the Antitype of matter which is in each parcel and portion thereof, whereby it will not be quite annihilated and brought to nothing: ſo that no burning, no weight or depreſſion, no weight nor no violence, nor any age or length of time can reduce any the ſmalleſt portion of matter to nothing; but it muſt ſtill be ſomething, and take up ſome place, and free it ſelf, (into what neceſſity ſoever it be brought) either by changing form or place, or (if it can do no otherwiſe) ſubſiſt as it is. Neither doth it ever come to that paſs, either to be nothing, or no where. Which Motion the Schools (which almoſt always name and define things rather by effects and diſcommodities, than by Internal cauſes) either points at by that Axiome, That two bodies cannot be in one place; or calls it a Motion, that there may be no penetration of dimenſions. Neither is it fitting to propoſe any examples of this Motion; for it is in every manner of body.

Let the ſecond Motion be the Motion which we call of Connexion by which bodies will not ſuffer themſelves in any part to be ſevered from the touching of another body, as rejoycing in that mutual connexion and touching. Which Motion the Schools call the Motion of their being no vacuity; as when water is drawn up by ſucking, or by Pipes; the fleſh by Ventoſes or Cupping-glaſſes; or when water ſtands ſtill and remains in Pitchers with holes in them, unleſs the Pitcher be opened, and the Air let in; and many things of this kind.

Let the third Motion be that Motion which we call of Liberty, by which bodies ſeek to free themſelves from a preternatural preſſure or ſtretching, and reſtore themſelves into a dimenſion fitting for their bodies. Of which Motion there are likewiſe innumerable examples; (as concerning the freeing from Preſſure) of water in ſwimming, of air in flying, of the Water in rowing, of the Air in the waving of winds: Neither doth the Motion of the Air thruſt up together, ſhew it ſelf very abſurdly in Guns, which Children play with, and are commonly called Pot-guns, which are made of a piece of Elder made hollow, into which they thruſt a piece of ſome juycie root or the like at both the ends: then with a Scowrer they thruſt this root up at one end towards the other root which is at the other end, which flyeth out with a ſound before the lowermoſt root or the ſcourer toucheth it. As for the freeing from tenſure or ſtretching, this Motion ſhews it ſelf in an Egg-ſhel after the Egge is ſucked up, in Strings; and Leather, and Cloth, which will ſhrink up again after they are ſtretched, unleſs they have quite altered their dimenſions by ſtanding too long a time ſtretched, &c. And this Motion the Schools call the Motion out of the Form of the Element; and that ignorantly enough, ſeeing that this Motion belongs not only to air, water, and flame, but to every diverſity of conſiſtencie; as of Wood, Iron, Lead, Cloth, Parchment, &c. In which each ſeveral bodies have a model or prefixed extent of their dimenſions, and from thence are hardly drawn to any notable ſpace. But this Motion of Liberty being moſt obvious and belonging to infinites, it will be adviſedly done to diſtinguiſh it plainly and well; for many do moſt careleſly confound this Motion with the other two of Antitype and connexion. Namely, the Motion from Preſſure, with the Motion of antitypie, and that of extenſion with the Motion of connexion. Therefore if the compreſſed bodies did yield or extend themſelves that there might not follow a Penetration of dimenſions, the bodies extended would grow back and contract themſelves that Vacuity might not follow: But if compreſſed air would recover and turn it ſelf into the thickneſs or denſity of Water, or Wood into the denſity of a ſtone, penetration of dimenſions would be needleſs; and yet there might be a far greater Compreſſion than they can any way admit of. And in the ſame manner, if Water could dilatate it ſelf into the rarity of air, or a Stone into rhe rarity of Wood, there would be no need of vacuity; and yet there might be a far greater extenſion of them, than they can any way ſuffer. Therefore the thing is not reduced to Penetration of dimenſions, and vacuity; but only in latter ends of Condenſation and Rarefaction; when notwithſtanding, theſe Motions ſtay and ſtop a long way on this ſide of them, and nothing elſe but deſires of the bodies to preſerve themſelves in their own Conſiſtencies, (or if they had rather, in their own Forms) and not to recede from them ſuddenly, unleſs they be altered by mild means, and by conſent. But it is far more neceſſary (becauſe it draws many things after it) to have it intimated unto men, that a Violent Motion (which we call Mechanical; and *Democritus*, who in expediting of his firſt Motions may be accounted leſs than the meaneſt of Philoſophers, calls the Motion of the Coaſt) is nothing elſe but the Motion of Liberty, namely from compreſſion to Relaxation. For in every ſimple Protruſion and thruſting forward, or flying in the air, there is no ſummotion or local carriage, before the parts of the body do preternaturally, or beyond nature ſuffer, and be compreſſed by the driver; and then the Parts ſucceſſively thruſting one another, the whole is carried, not only going forward, but withall wheeling: that by this means the Parts may free themſelves, or ſuffer more than is juſt. And ſo much for this Motion.

Let the fourth Motion be that which we have termed Motion of *Hyles*; which Motion is in a manner contrary to that Motion which we have ſpoken of, namely, the Motion of Liberty. For in the Motion of Liberty, the bodies do utterly abhor, reject and ſhun a new Dimenſion, or new Sphere, or new Dilatation or Contraction, (for this variety of words expreſs all one thing) and ſtrive with all their might to recover, and return to their old Conſiſtency. But contrariwiſe in this motion of *Hyles*, the bodies do deſire a new Sphere or Dimenſion, and do willingly, and withall their might (as in Gun-powder) haſten towards it. But the moſt powerful, and moſt frequent, if not the onely inſtruments of this motion, are Heat and Cold. As for example, if air be dilatated by Tenſure or ſtretching out, as by ſucking of Glaſs-Eggs, it hath a longing deſire to be reſtored: But if you apply Heat to it, it will contrariwiſe deſire to be dilatated, and to be in a new Sphere, and paſſes into it willingly as into a new Forme, as they call it. Neither after it is dilatated doth it care for returning, unleſs it be invited to it by application of ſome cold thing, which is not properly a return, but a repeated Tranſmutation. And in the like manner, water, if it be reſtrained within narrower bounds by compreſſion, it ſpurns againſt it, and deſires to be again what it was, namely, larger. But if there comes a ſtrong and continued cold, it changeth willingly and of its own accord, and is condenſed into Ice: and if the cold continue, and is not interrupted by warm weather, (as it is oftentimes in deep Caves and Grots) it turns to Chryſtal, or ſome ſuch like matter, and is never reſtored to its primitive being.

Let the fifth motion be the motion of Continuation; we do not mean the ſimple and primary continuation with ſome other body or ſubſtance (for that is the motion of Connexion) but of Continuation of it ſelf in a certain body. For it is moſt certain, that all bodies do abhor the diſſolution of Continuity, ſome more, ſome leſs, but all in ſome meaſure. For as in hard bodies, (as ſteel or glaſs) the reluctancy againſt Diſcontinuation is very ſtrong; ſo in Liquors, where this kind of motion ſeems to ceaſe, or at the leaſt languiſh, yet there is not an abſolute pivation of it, but it plainly remains in them, as in the loweſt degree, and ſhews it ſelf in, and by many experiences, as in Bubbles, and the roundneſs of drops, in the ſmalleſt threads of running Gutters, and in the holding together, and drawing out as it were in threads of glutinous bodies, and the like. But this deſire is moſt plainly apparant, if we attempt a diſcontinuation by leſſer fractions. For in Morters after Contuſion is made to a certain degree the Peſtel operates no more: Water will not get in at the ſmalleſt chinks or creviſes: and Air it ſelf notwithſtanding the ſubtileneſs of its body, cannot ſuddenly paſs thorow the pores of ſolid Veſſels, but by a long inſinuation.

Let the ſixt Motion be the motion which we call a Motion to Lucre or Gain: Or the motion of Indigency or Want. Which is that by which bodies when they converſe amongſt others, which are meerly Heterogeneal, and as it were enemies; if they can but get a conveniency or means to avoid thoſe Heterogeneals, and apply themſelves to ſuch as have more affinity with them, (though even they do not thorowly agree with them) they preſently embrace them, and make choice of them, and ſeem to make ſome gain thereby; from whence we have taken the word, as being in want and Indigency of ſuch bodies. As for example, Gold or any other metal beaten out to leaf, delights not in having Air about it; therefore if it can come at ſome thick and tangible body, (as a finger, paper, or the like) it ſticks preſently, and can hardly be gotten off. Likewiſe Paper, and Cloth, and the like, do not well agree with the air which is inſerted and commixed in their Pores; wherefore they willingly drink in water, and drive out the Air. Likewiſe Sugar or a Spung put into Water or Wine, though part of them ſtand up, and be far above the Water or Wine, yet by little and little, and by degrees they draw the Water or Wine upwards.

wards. From whence is taken an excellent rule for the opening and ſolution of bodies; for laying aſide Corroſives, and ſtrong waters, which open a way for themſelves, if there might be found a proportionate and more agreeing and conſenting ſolid body, than that wherewith it is (as it were through neceſſity) mixed, preſently the body ſlacks, and opens it ſelf, and receives the other within it, excluding and putting away the firſt. Neither doth this Motion to Lucre onely operate, or hath power upon the feeling: For the Operation of Amber, (of which *Gilbertus* and others ſince him have raiſed ſuch Fables) is no other but the Appetite of the body raiſed and excited by ſome light frication or rubbing, which doth not very well tolerate the Air, but had rather have ſome other tangible thing, if ſo be there be any near unto it.

Let the ſeventh Motion be the Motion (which we call) of greater Congregation; by which bodies are carried to the maſſes of the Connaturals, as ponderous things to the Globe of the earth, light things towards the circumference of the heavens. This the Schools upon ſlight contemplation have ſpecified by the name of Natural Motion: Becauſe there was nothing of *ab extra*, or externally to be ſeen which ſhould cauſe that Motion, (therefore they thought in-bred and placed firmly in it:) Or peradventure becauſe it doth not ceaſe: Which is no marvail, for the heaven and the earth are always ready and at hand; whereas contrariwiſe, the cauſes and beginnings of moſt of the other Motions are ſometimes abſent ſometimes preſent. Therefore becauſe this doth intermit, but always meets the other when they intermit, they made this perpetual and proper, and the reſt as it were but acquired. But this Motion is indeed weak and dull enough, as ſuccumbing and yielding (unleſs there be a greater maſs of body) to other Motions as long as they are in operation. And though this Motion hath ſo filled mens thoughts, that it hath almoſt hidden all other Motions, yet it is but little that men know of it, but are plunged in many errors about it.

Let the eight Motion be the Motion of the leſſer Congregation, by which the Homogeneal parts in any body ſeparate themſelves from the Heterogeneal, and come together amongſt themſelves: by which alſo whole bodies, through ſimilitude of ſubſtance, embrace and nouriſh one another, and ſometimes are congregated and drawn together from ſome diſtance; as when the cream, after ſome pauſe of time, ſwims upon the top of the Milk, the Lees and Tartar ſettle at the bottom of the Wine. For theſe things are not done by the motion of Gravity and Levity, that ſome parts ſwim at the top, and others go to the bottom, but through the deſire of the Homogeneals of comming together, and uniting themſelves. And this motion differs from the motion of Indigency in two things. The firſt, that in the Motion of Indigency there is a greater provocation of the Malignant and contrary nature: but in this motion (if there be no obſtacles or tyes) the parts are united by friendſhip, though the Alien Nature be abſent, which moveth ſtrife. The ſecond thing wherein they differ, is, that the union is more ſtrict, and as it were with more delight: For in the other, ſo that the adverſe body be ſhunned, thoſe bodies which have no great affinity one with the other, do notwithſtanding concur: But in this ſubſtances come together, which are knit one to another as it were by a twin-like ſubſtance, and are in a manner made up into one. And this motion is in all compounded bodies, and would eaſily be ſeen in each one of them, if it were not tyed up and reſtrained by other appetites and neceſſities of bodies, which diſturb this Coition and going together. And this motion is moſt commonly tyed and bound up three ways; By the numneſs of bodies; The curb of the predominant body; And the external motion. As for the numneſs of Bodies, it is moſt certain, that there is in all Tangible bodies a kind of ſloth, either more or leſs, and a kind of averſion from local Motion, ſo that unleſs they be excited and ſtirred up thereunto, they had rather remain in that ſtate wherein they are, than ſeek after a better. And this Numneſs, or Dulneſs, or Sloth, is to be ſhaken off by a threefold help: Either by heat, or by an eminent Vertue of ſome allyed body, or by a lively and powerful motion. And firſt as concerning the aſſiſtance of heat, from thence it proceeds that heat is defined to be that ſeparates Heterogeneals, and brings Homogeneals together. Which definition of the *Peripateticks*, *Gilbertus* did moſt deſervingly deride, ſaying that it is as if a man ſhould define a man to be it which ſoweth Corn, and planteth Vineyards, which is but only a Definition by effects, and thoſe alſo particular ones. And this Definition is yet further to be blamed: For thoſe effects (whatſoever they be) proceed not from the propriety of heat, but only by meer accident (for cold will do the ſame, as we ſhall ſhew hereafter) namely, by the deſire which Homogeneal parts have to come together: Heat onely helping to ſhake off the dulneſs, which before had bound up the deſire. Secondly, as concerning the Aſſiſtance of the vertue of the allyed body that doth wonderfully appear in an armed Load-ſtone. For the Nature of an armed Load-ſtone is ſuch, that at a certain diſtance it will not draw nor attract Iron ſtronger than a Load-ſtone which is not armed: but if the Iron be brought ſo near to it, that the armed Loadſtone touch it, it will take up a greater quantity of Iron than a plain and unarmed Loadſtone, by reaſon of the ſimilitude of the ſubſtance of Iron to Iron. Thirdly, as concerning the aſſiſtance of Motion, it may be perceived in Arrows which are made all of wood, and are not headed with Iron, of which it is reported, that being ſhot out of a Peece of Ordnance will penetrate further into any wooden ſubſtance (as the ſides of ſhips or the like) than thoſe which are headed with Iron, by reaſon of the ſubſtances ſimilitude wood to wood, though this vertue lay hidden in the wood, the numneſs of the wood being ſhaken off by the celerity of the Motion. But the binding of the Motion of the minor Congregation, which is by the curb of the Dominating or commanding body; it appears in the diſſolving of bloud and urine by means of cold: For as long as thoſe bodies are repleniſhed with an active ſpirit, which as Maſter of the whole orders, and keeps in each ſingular part, ſo long the Heterogeneal cannot come together, by reaſon of the curb: But when that ſpirit is once evaporated or ſuffocated by cold, then the parts freed from the courb come together according to their own natural deſire. And thence it proceeds that all ſubſtances which contain a ſharp ſpirit, (as Salt and the like) laſt and do not diſſolve by reaſon of the laſting and permanent curb of the commanding and imperious ſpirit. The binding of the motion of the Minor Congregation, which is done by an external motion is eſpecially perceived in the Agitations of Bodies, by which Putrefaction is hindred. For all manner of Putrefaction is grounded upon the Congregation or gathering together of Homogeneals, whereby by little and little is cauſed the Corruption (as they call it) of the firſt form, and the generation of another new one. For the diſſolution of the old form goes before Putrefaction, which prepares the way to the Generation of the new form, which is the Coition it ſelf to Homogenia, and that if it be not hindred becomes a ſimple ſolution; but if there come divers things in the way to hinder it, then Putrefactions follow, which are rudiments or beginnings of a new Generation. And if (which is the thing we have now in hand) there be a frequent agitation by an external motion, then this motion of Coition (which is delicate and tender, and deſires reſt outwardly) is diſturbed and ceaſeth, as we ſee in an innumerable company of things: As when a daily agitation or running water expels Putrefaction, Winds drive a way the Peſtilence of the Air, Corn in Garners of the Air, or Store-houſes turned and toſſed up and down continue pure, and finally all things that are agitated outwardly, do not eaſily putrifie inwardly. We muſt not at laſt omit that Coition or going together of Parts of the body, which chiefly cauſeth Induration, or Deſiccation. For after the ſpirit, or ſome humidity turned into ſpirit is fled out of ſome porous body (as in Wood, a Bone, a Parchment, and the like) then the thickeſt parts are contracted and grow up together with greater vehemence, whereupon grows Exſiccetion, or Induration, which we believe to be done, not ſo much by the motion of Connexion, that there may be no vacuity as by this motion of Amity and Union. As concerning the Coition at diſtance, that is very unfrequent and rare, and yet it is in more things than is obſerved. The repreſentations of theſe are one bubble diſſolving another. Medicaments draw humours out of the ſimilitude of ſubſtance; one ſtring moves another ſtring in a ſeveral inſtrument to an Uniſon and the like. I conceive this kind of motion likewiſe to be in the ſpirits of living or animal things, but this is as yet unknown. But certainly it is eminent in the Load-ſtone and Iron raiſed up. Now when we ſpeak of the motions of the Load-ſtone, they muſt be plainly diſtinguiſhed: for there are four vertues or operations in the Load-ſtone which ought not to be confounded but ſeparated, though the admiration and ſtupidity of men hath mixed them, the one is the Coition or coming together of the Load-ſtone with the Load-ſtone, or of Iron with the Load ſtone, or of Iron with Iron touched therewith. The ſecond is of its turning North and South, and alſo of its Declination: the third is of its penetrating through Gold, Glaſs, Stone, or any thing: The fourth is of the Communication of its vertue from the ſtone into Iron, and from Iron into Iron, without any communication of the ſubſtance: but in this place we ſpeak only of its firſt vertue; namely, of its Coition or coming together. That is alſo a notable Coition of Quickſilver and Gold, ſo that Gold will attract Quickſilver, though it be made up in Unguents, and thoſe who work amongſt the vapours of Quick-ſilver, uſe to hold a piece of Gold in their mouths, to gather together the emiſſions of the Quick-ſilver, which would otherwiſe invade and penetrate their craniums and bones, and cauſeth the gold ſo held in their mouths to turn white. And thus much ſhall ſuffice to be ſpoken of the motion of the leſſer Congregation.

Let the ninth Motion be the Magnetick Motion, which though it be of the ſame kind, as the Motion of the Leſſer Congregation; yet if it operate at great diſtances, and upon great maſſes of things, it deſerves a ſeveral Inquiſition: eſpecially if it do not begin with touching, nor doth not bring the action to the touch, as all Congregating Motions do; but only elevates the bodies, or cauſes them to ſwell, and no more. For if the Moon raiſeth the waters, or cauſeth moiſt things to ſwell up; or the ſtarry sky draws their Planets towards their Apogea; or the Sun binds together the ſtars of *Venus* and *Mercury*, that they can go no further from his body then to ſuch a certain diſtance. Theſe Motions ſeem cannot be well placed neither under the Major nor Minor Congregation, but are as it were middle or imperfect Congregatives, and muſt have a proper ſpecies or kind to themſelves.

Let the tenth Motion be the Motion of Flight or Shunning: Namely, a Motion contrary to that of the Minor Congregation: by which bodies through Antipathy flie from ſuch bodies as are enemies to them, ſeparate themſelves from them,and refuſe to mix with them. For though in ſome things this Motion ſeem to be only an accidental Motion, or by conſequence, in reſpect of the motion of the leſſer Congregation, becauſe Homogeneals cannot come together, but the Heterogeneals muſt be excluded and removed. Yet this motion muſt be placed by it ſelf, and be made one ſeveral kind or ſpecies, becauſe in many things the deſire of Flight is leſs principal than the appetite or deſire of Coition or coming together. And this Motion is moſt eminent in the Excrements of living Creatures, and likewiſe in the hateful objects of ſome ſenſes, eſpecially thoſe of ſmelling and taſting. For a ſtinking ſmell is ſo hateful to the ſence of ſmelling, that it brings the motion of expulſion into the Orifice of the ſtomack by conſent: a bitter and horrid ſavour is ſo rejected by the Palate or the throat, that it cauſeth a ſhaking and horror of the head by conſent. But this Motion doth likewiſe take place in other things, for it may be perceived in ſome Antiperiſtaſes; as in the middle Region of the Air, whoſe coldneſs ſeems to be the rejection of Natural coldneſs from the heavenly confines; as likewiſe thoſe great heats and Inflammations which are found in ſubterraneal places,are rejections of the hot Nature from the Bowels of the Earth: for heat and cold, if they be in a Minor or leſſer quantity, do deſtroy each other; but if they be in greater Maſſes, and as it were in equal Armies, they thruſt one another out of place. It is reported alſo, that Cinamon, and other fragrant and odoriferous Plants being ſet by Privies and ſtinking places, will retain their own fragrancy the longer, as refuſing to come forth and mix themſelves with the ſtinking ſmels. And truly Quick-ſilver,which would otherwiſe reunite it ſelf into an entire body, is hindred from it by mans ſpittle or Barrows-greaſe, or Turpentine, and the like, and cannot gather its parts together, by reaſon of their diſſent with ſuch bodies, from which being circumfuſed round about them, they withdraw themſelves. So that their flight from theſe interjacent things is of more force than the deſire of reuniting themſelves with thoſe parts which are of the ſame kind; and this is called mortifying or killing of Quick-ſilver. Alſo that Oyl will not mix with water, is not onely by reaſon of the difference of levity or lightneſs, but by reaſon of their evill agreement, for the ſpirit of Wine which is lighter than Oyl will mix with water. But this motion of Flight is moſt notable in Niter, and ſuch like crude bodies which do abhor fire, as Gunne-powder, Quick-ſilver, Gold, and the like. But the Flight of Iron from the other Magnetick Pole is by *Gilbertus* very well obſerved to be not properly a Flight, but a Conformity and Coition to a more convenient ſituation.

Let the eleventh Motion be the Motion of Aſſembling, or Multiplying of its ſelf,or of ſimple Generation. And,we call ſimple Generation not of whole or Integral bodies, as in Plants and living things, but of ſimular or like bodies; That is to ſay, that by this Motion bodies which are alike do turn other bodies which have ſome affinity with them, or at leaſt are well diſpoſed or prepared, into their own ſubſtance or Nature: As flame which multiplies it ſelf upon breaths and oylie things, and ingenders a new Flame: Air, which upon water and watery things multiplyes it ſelf and ingenders a new Air: The Vegitable ſpirit which multiplies it ſelf in its nouriſhments upon the moſt ſubtile and thin parts, as well of watery as oylie things, and ingenders a new ſpirit, the ſolid parts of Plants, and living Creatures, as Leaves,Flowers,Fleſh,Bone, and the like, each of which out of the juyces of nouriſhments do aſſimilate and ingender a ſucceſſive ſubſtance and excretion. For we would not have any man dote with *Paracelſus*, who (blinded with his Diſtillations) would have Nutrition made by ſeparation only;and that in bread or food there lyeth hidden the Eye, Noſe, Brain, Liver, *&c.* in the moiſture of the earth, the Root, the Leaf, the Flower. For as a Carver or Sculpter out of a rude Maſs of wood or ſtone will bring forth a Leaf, a Flower, an Eye, a Noſe, a Hand, a Foot, or the like, by ſeparating and putting away what is ſuperfluous: ſo that chief internal workman (ſaith he) will by ſeparation and rejection out of food bring forth ſeveral members and parts. But laying ſuch trifles and toys aſide, it is moſt certain, that each ſeveral parts,as well Similar as Organical, in Vegitables and Animals, do firſt with ſome delight attract, then aſſimilate and turn into their own Nature, the juyces of their ſeveral foods almoſt common, or at leaſt not much unlike. Neither is this aſſimilation or ſimple Generation in animate bodies only, but the Inanimate alſo participate thereof, as we have ſaid of Flame and Air. And alſo the dead ſpirit which is contained in every tangible animate thing, doth always work, to digeſt and turn the thicker parts into ſpirit,which may afterwards go forth: whence comes the diminution of weight, and the drying up, as we ſaid elſewhere: Neither is that accretion, or growing together, which they commonly reject in alimentation be rejected in aſſimilation, as when Mud grows together amongſt ſmall ſtones, and is turned into a ſtony ſubſtance: Scales about the Teeth turn into a ſubſtance as hard as the Teeth themſelves, *&c.* For we are of that opinion that there is in all bodies a deſire of aſſimilation or making alike, as great as that of Homogeneals to come together; but this vertue is bound up as well as the other, but not by the ſame means: But we muſt with our greateſt care inquire out thoſe means, and the way of getting looſe from them; becauſe they belong to the comforting of old age. Laſtly, it is worthy to be noted, that in nine of thoſe motions whereof we have ſpoken,bodies do only deſire their own preſervation, but in this eleventh they deſire to have it propagated.

Let the twelfth Motion be the motion of Excitation, which motion ſeems to be of the ſame kind as aſſimilation, and ſometimes it is ſo by us promiſcuouſly called: For it is a Diffuſive, Communicative, Tranſitive, and multiplicative motion, as well as the other; and they agree for the moſt part in their effects, though they differ in the manner and ſubject of effecting. For the motion of aſſimilation proceeds as it were with command and power; for it commands and conſtrains the aſſimilated thing to turn and chang it ſelf into the aſſimilant. But the motion of Excitation proceeds as it were with Art and Inſinuation, and by ſtealth; for it doth only invite and diſpoſe the thing excited to the nature of the exciting thing: alſo the motion of aſſimilation doth multiply and tranſform bodies and ſubſtances; as for example, there is more flame, more air, more ſpirit, more fleſh made: But in the Motion of Excitation the vertues only are multiplyed and tranſported, and there is made more heat, more Magnetick power, more rottenneſs. And this Motion is moſt eminent in heat and cold: For heat doth not diffuſe it ſelf in heating, by the communication of the firſt heat, but only by Excitation of the parts of the body to that Motion, which is the form of heat, of which we ſpake in the firſt Vindemiation of heat; ſo that heat is far more ſlowly and difficulty excited in a ſtone or Metal, than it is in Air, by reaſon of the Inability and unreadineſs of thoſe bodies to that Motion: ſo that it is likely that there may be ſuch matters within the Bowels of the earth, as do utterly refuſe to be heated, by reaſon that through their greater condenſation they are deſtitute of that ſpirit, from which this Motion of Excitation firſt begins. So the Load-ſtone doth endure Iron with a new diſpoſition of parts, yet it loſeth nothing of its vertue: ſo the Leaven of Bread, the Flower or Yeaſt of Drink, and the runnet which coagulates milk; and likewiſe ſome poiſons do excite and invite Motion in a quantity of Meal, or Beer, or Cheeſe, ſucceſſively and continuately, not ſo much by the power of the excitor, as by the prediſpoſition and eaſie yeelding of the excited.

Let the thirteenth Motion be the Motion of Impreſſion; which motion is likewiſe of the ſame kind as the motion of aſſimilation, and is the moſt ſubtile of all Diffuſive motions. Yet we thought good to place it in a proper ſpecies, becauſe of the notable difference which is between it and the former two: For the plain and ſimple Motion of aſſimilation doth transform the bodies themſelves: ſo that if you take away the firſt mover, it nothing concerns thoſe which follow; for the firſt kindling into Flame, or the firſt turning into air, doth nothing concern the flame or the air which ſucceeds in Generation. Likewiſe the Motion of Excitation remains for a very long time, the firſt mover being taken away; as in a heated body, the firſt heater being laid away: in Iron excited, the Load-ſtone being taken away; in the heap of Meal, the Leaven being laid aſide. But the motion of Impreſſion, though it be Diffuſive and Tranſitive, yet it ſeems to depend upon the firſt mover: ſo that it ever being taken away or ceaſing, it preſently fails or periſhes; ſo that it is ended in a moment, or in a very little time. Wherefore we uſe to call thoſe motions of Aſſimilation and Excitation, the motion of *Jupiters* Generation, becauſe the Generation remains; and this motion of Impreſſion the motion of the Generation of *Saturn*, becauſe that as ſoon as it is born it is devoured and ſwallowed up. And this motion manifeſts it ſelf in three things; in the beams or glimpſes of light, in the ſtroak of ſounds, and magnetick forces, as concerning communication. For the light being taken away, the colours preſently periſh, together with the other Images of it. The firſt ſtroak and ſhaking of the body cauſed thereby being ended, preſently after the ſound periſheth. For ſounds are toſſed up and down by Winds, as it were by Waters; yet you muſt more diligently obſerve, that the ſound doth not laſt ſo long as there is a reſounding: For the Bell being Rung, the ſound ſeems to continue for a long time; whereby by a man may eaſily fall into an error if he think or imagine that ſound doth ſtick, or as it were ſwim in the air all that while, which is moſt falſe. For that reſounding is not the ſame ſound in Number, but is only renewed: and this is made manifeſt by the ſtopping or cohibition of the ſtricken or ſmitten body; for if the Bell be ſtrongly ſtayed or withheld and kept immoveable, preſently the ſound periſheth, and it ſounds no more, as in ſtrings, if after the firſt ſtroak the ſtring be touched with the finger, as in the Harp, or with the quill, as in Virginals, preſently the reſounding ceaſeth. The Load-ſtone being taken away, the Iron preſently falls: But the Moon cannot be removed from the Sea, nor the earth from any thing that is ponderous when it falls; therefore there can be no trial made of them, but howſoever the reaſon is alike.

Let the fourteenth Motion be the motion of Configuration, or Situation, by which bodies ſeem to deſire not any Coition, nor ſeparation, but a Situation, Collocation, and Configuration with others. But this is a moſt abſtruſe and hidden motion, neither hath it been well enquired about; and in ſome things it ſeems as it were to be incauſable, though indeed (as we believe) it be not ſo. For if one ſhould ask why the heaven turneth and wheeleth from Eaſt to Weſt, rather than from Weſt to Eaſt; or why it turns about thoſe Poles which are ſet about the *Urſas* or Bears, rather than about *Orion*, or any other part of the Heaven: This Queſtion ſeems to be as it were ſome Extaſis, ſeeing that ſuch things ſhould rather through experience be received as poſitive: and there are indeed in Nature ſome ultimate and incauſable things, but this is none of them. For we hold this to be done by a certain harmony and conſent of the world, which is not yet come into obſervation: but if the Motion of the earth be admitted to be from Weſt to Eaſt, the ſame Queſtions do remain; for it alſo moves upon ſome Poles, and why at laſt ſhould theſe Poles be placed where they are rather than any where elſe. Alſo the verticity and direction, and Declination of the Loadſtone are referred to this motion. Likewiſe there are found as well in Natural as Artificial bodies, eſpecially thoſe which are conſiſtent, and not fluid; a certain collocation and poſture of parts, and as it were wooll and threads, which muſt be diligently ſearched out and enquired after, as being ſuch that without the finding of them, thoſe bodies cannot be eaſily touched nor guided; but thoſe Circulations in liquid things, by which, they while they are preſſed before they can free themſelves, do relieve each other, that they may bear that compreſſion equally, we do more truely aſſign to the motion of Liberty.

Let the fifteenth Motion be the motion of Pertranſition, or the motion according to the iſſues or holes by which the vertues of bodies are more or leſs hindred or forwarded by their mediums or means, according to the Nature of the operating bodies or vertues, and alſo of the means: For one medium or means is convenient for the light, another for the ſound, another for heat and cold, another for magnetick Vertues, and for other things reſpectively.

Let the ſixteenth motion be the Regal or Politick motion, for ſo we call it. By which the predominant and commanding parts do bridle, tame, ſubdue and order the reſt of the parts, and force them to be gathered together, and ſeparated, to ſtop, move, and be placed, not according to their own deſires, but as it is in order, and expedient for the well being of that commanding part: ſo that it is as it were a kind of Government, and Policy which the ruling part exerciſeth over the ſubjected parts. And this Motion is moſt eminent in the ſpirits of living things, which Motion doth temper together all the Motions of the reſt of the parts, as long as it ſelf is in vigor and force. It is likewiſe to be found in other bodies in a certain inferiour degree, as hath been ſaid of blood and urines, which are not diſſolved, till the ſpirit which reſtrained and mixed their parts was let forth, or ſuffocated. Neither is this Motion altogether proper to Spirits, though Spirits are predominant in moſt bodies, by reaſon of their quick and penetrating Motion. But in bodies which are more condenſed, and are not filled with a lively and vigorous ſpirit, ſuch as is in Quick-ſilver and Vitriol, the thicker parts are predominant; ſo that unleſs this curb and yoke be ſome way ſhaken off, we muſt not hope for any new transformation of ſuch bodies.

Let the ſeventeenth Motion be the Spontaneal or Willing Motion of Rotation or wheeling: by which bodies that delight in Motion, and are well placed, do enjoy themſelves, and follow one another, and not any thing elſe, ſeeking (as it were) their own embraces. For bodies ſeem either to move without any term, or to ſtand quite ſtill, or to be carried to that term, where through their own Nature they muſt either wheel or ſtand ſtill: And thoſe things that are well placed, if they enjoy Motion, do move circularly, namely with an Eternal an Infinite motion. Thoſe things which are well placed, and are averſe from motion, do ſtand quite ſtill: Thoſe which are not well placed do move in a direct line, (as by the ſhorteſt path) to the company of their connaturals. And this motion of Rotation or wheeling, admits of ſeven differences: The firſt of its Center about which the bodies move: The ſecond of their Poles upon which they move: The third of its circumference or compaſs, according as they are diſtant from the Center: The fourth of their Incitation, according as they move either more ſlowly, or more ſwiftly: The fifth of the conſecution of their Motion, as from Eaſt to Weſt, or from Weſt to Eaſt: The ſixt of the Declination from the perfect Circle by threads or lines nearer to, or further from the Center: The ſeventh of its declination from the perfect circle by the Lines nearer to, or further from their Poles: The eighth of the further or nearer diſtance of their Lines one from the other: The ninth and laſt of the variations of the Poles themſelves, if they be moveable; the which doth not belong to Rotation or wheeling, unleſs it be done circularly; And this Motion by the common and inveterate opinion is held to be the proper Motion of the Heavens: Yet there is a great Queſtion amongſt ſome as well ancient as modern concerning that Motion, who have attributed this Rotation or wheeling to the earth. But it would be a far more juſt queſtion or controverſie (if the thing be not without queſtion) namely, whether this Motion (granted that the Earth doth ſtand ſtill) be contained within the bounds of the heaven, or rather deſcends and communicates it ſelf to the Air and to the Waters. But the motion of Rotation in darted things, as in Arrows, Darts, Bullets for Guns, and the like, we remit altogether to the motion of Liberty.

Let the eighteenth motion be the motion of Trepidation, to which (as it is underſtood by Aſtronomers) we give no great credit. But to us who ſeriouſly ſeek out every where the Appetites and Deſires of Natural bodies, this motion comes in our way, and ſeems it ought to be placed in ſpecie, as of a ſeveral kind. And this motion is as it were of a certain perpetual captivity or bondage: namely, in which bodies being not altogether well placed according to their Nature, nor yet finding themſelves altogether ill, do trepidate or agitate continually, taking no reſt, as not contented with the ſtate they are in, nor yet daring to proceed any further. And ſuch a motion is found in the heart and pulſes of living Creatures, and muſt of neceſſity be in all bodies which are in an anxious and doubtful caſe between commodities and diſcommodities, that being diſtracted do trie to free themſelves, and ſtill receive a repulſe, yet ſtill go on trying.

Let the nineteenth and laſt motion be that to which the name of motion ſcarce belongeth, and yet is a meer motion. Which motion we may call the motion of lying down, or the motion of abhorring of motion. By this motion the earth ſtands in its own frame, the extreams of it moving themſelves into the middle, not to the imaginative Center, but to Union. By this appetite alſo all things which are condenſed or grown thick in a high degree do abhor motion, and all their appetite is, not to move: and though they be provoked infinitely to move, yet (as far as they can) they preſerve their own Nature. And if they be forced to motion, yet they ſeem always to endeavour to recover their own eſtate and reſt, to move no more. And indeed about this they are active enough, and do ſtrive ſwiftly and ſpeedily enough, as being impatient of any delay. But the Image of this appetite can but partly be diſcerned, becauſe with us by the ſubagitation and concoction of the Celeſtials, every tangible thing is not only not condenſed to the height, but is alſo mixed with ſome ſpirit. We have therefore now propoſed the ſpecies, or ſimple Elements of Motions, Appetites, and Active Vertues which are moſt univerſal in Nature: neither is there a ſmall part of Natural Knowledg ſhadowed under theſe. Yet we do not deny, but that other ſpecies may peradventure be added, and that theſe very Diviſions may be tranſported according to the truer veins of things, and be reduced into a ſmaller number: Yet we do not mean this of any abſtracted Diviſions; As who ſhould ſay, that bodies deſire either the Preſervation or Exaltation, or Propagation, or Fruition of their own Nature; or as if one ſhould ſay, that the motions of things do tend to the Preſervation and good either of the Univerſal, as Antitypie, or Connexion, or of great Univerſalities as the motion of the greater Congregation, or of Rotation and wheeling, or of the abhorring of motion, or of ſpecial Forms, as the reſt of motions. For though theſe things be true, yet unleſs they be terminated in Matter and Fabrick, according to the true lines, they are ſpeculative and leſs profitable. In the mean time they will be ſufficient, and of good uſe to weigh the Predominances of Virtues, and enquire out the Inſtances of ſtrife. For of theſe motions whereof we have ſpoken, ſome are altogether invincible, ſome are ſtronger, and bind, curb and diſpoſe them. Some do ſhoot out and dart further: ſome do prevent others in time and ſwiftneſs: ſome do nouriſh, ſtrengthen, enlarge, and haſten the other.

The Motion of Antitypie is altogether Adamantive and Invincible. But whether the Motion of Connexion be ſo or no, we yet doubt of. For we will not for a certainty affirm whether there be a Vacuity, or Coacervation and heaping up, or a Permixion. But this we are ſure of, that the reaſon which *Lucippus* and *Democritus* give to bring in a vacuity (namely becauſe without it the ſame bodies could not fill up and contain greater and leſſer ſpaces) is falſe. For certainly it is the fold of the matter doubling and redoubling it ſelf by ſpaces within certain bounds, without interpoſition of Vacuity. Neither is there in air two thouſand times more (for ſo much it muſt be) of Vacuity than there is in Gold, which is ſufficiently known to us by the moſt powerful vertues of Pneumatick or windy bodies, (which otherwiſe would ſwim in Vacuity like ſmall duſt) and many other Demonſtrations. And the reſt of the Motions do govern, and are governed one by another according to the Vigor, Quantity, Incitation, Ejaculation, and according to the helps and hindrances which do happen. As for example, ſome Load-ſtone armed will draw up and hold Iron which ſhall weigh threeſcore times as much as it ſelf: ſo far the Motion of the leſſer Congregation doth predominate above the Motion of the greater Congregation; And if there be any greater weight it yields. A Beam will bear ſome weight of timber: So far doth the Motion of Liberty predominate upon the motion of the greater Congregation: But if the weight be more it will yield. Leather ſtretched out to ſuch an extent will not tear: So far the Motion of Continuation predominates upon the Motion of Extenſion; But if it be ſtretched any further, the Leather tears, and the Motion of Continuation doth yield. Water runs out at a creviſe of ſuch a bigneſs, ſo far the Motion of the greater Congregation predominates over the Motion of Continuation: and if the creviſe be leſſer it yields, and the Motion of Continuation overcomes. The powder of Sulphur alone put into a Gun with a Bullet and fired doth not drive out the Bullet; In that the Motion of the greater Congregation overcomes the motion of *Hyles*: but gunpowder being put in ,it overcomes the motion of *Hyles* in the Brimſtone, being helped by the Motions of *Hyles*, and of Flight in the Niter, and ſo of the reſt. For the inſtances of ſtrife (which ſhew the predominancy of vertues, and according to what means and degrees they predominate and yield) is to be ſought out by a ſharp and diligent Inquiſition. Likewiſe the means and ways of the ſuccumbency and yielding of Motions are carefully to be looked into: Namely, whether they ceaſe altogether, or whether they only ſtrive ſo to do, and are withheld. For in bodies here with us there is no true reſt, neither in the whole, nor in the parts, but only in appearance and ſeemingneſs. And this ſeeming Quietneſs or reſt, is cauſed either by the Counterpoiſe, or the predominancy of Motions: By counterpoiſe, as in Scales which ſtand even if the weights be equal; By predominancy, as in pitchers which have holes in them, where the water lyeth ſtill, and is kept from falling by the predominancy of the motion of Connexion: Yet we muſt obſerve (as we ſaid before) how far thoſe yielding Motions do ſtrive. For if any one through ſtriving be kept down ſtretched out upon the earth, with his arms and legs bound, or otherwiſe held, and yet he with all his force ſtrive to get up, his ſtriving is nothing the leſs, though it doth not availe. But the condition of this thing, (namely, whether the yielding motion be as it were annihilated by the predominancy, or whether the ſtrife continue, though it is not perceived) which lyeth hidden in Conflicts, will peradventure appear in concurrencies. Let the trial be made in Guns; whether a Gun will ſhoot a bullet furtheſt in a direct line, which we call point blank, or ſhooting upwards where the only force carries the Bullet, or downwards, where the Motion of Gravity concurs with the force of the blow. Alſo the Rules of Predominancies which come in the way are to be gathered together: As the commoner the good is which is deſired, the ſtronger it is; As the motion of Connexion, which looks upon the communion of the Univerſal, is ſtronger than the Motion of Gravity or weight, which looks only upon the communion of denſe and ſolid things. Alſo that the deſires of a private good, moſt commonly do not prevail againſt the deſires which are for a more Publick good, but in ſome ſmall quantities. Which would God we might obtain in Civil Affairs.

The way how to find out the Cauſes of the Ebbing and flowing of the Sea.

THis motion muſt of neceſſity be brought to paſſe, either by the Progreſs, and Regreſſe of waters, like unto water toſſed up and down in a Tub, which when it waſheth one ſide of the Tub, forſaketh the other ſide: or by the riſing and falling of the waters from the bottome, like unto water that boiles up and falls again. Now which of theſe two cauſes muſt be the cauſe of Ebbing and Flowing is the queſtion. If the firſt aſſertion be admitted of, then of neceſſity when the flowing of the ſea is one way, the ſea muſt at the ſame time in one place or other be Ebbing: and this is the thing which we enquired. *Acoſta* with ſome others (after diligent enquirie) have obſerved, that on the ſhoars of *Florida* and the oppoſite ſhoars of *Spain* and *Africk*, the Ebbings and Flowings of the Sea are at the ſame time, and not contrariwiſe, when it flows at the ſhoars of *Florida*, it ebbs on the ſhoars of *Spain* and *Africa.* But if one give more attention, and take better heed, the riſing motion is not confirmed, nor the motion by Progreſs denyed. For it may be that the motion of waters in Progreſs may be, and yet it may flow upon the oppoſite banks of the ſame Channel, at the ſame time; namely, if the waters be forced and driven in from another place, as it is in Rivers which ebb and flow on both their banks on each ſide at the ſame time, this motion notwithſtanding being a meer motion in Progreſs, namely, of waters coming in at the mouths of the Rivers out of the Sea: ſo in the ſame manner waters coming in great abundance out of the IndianEaſtern Ocean, may be be driven and thruſt into the Channel of the *Atlantick* Sea, and therefore may over-flow both banks at one time. Therefore we muſt enquire whether there be ever another Channel by which the waters may ebb, and ſo diminiſh at the ſame time: And behold here is the ſouth ſea at hand, which is no leſſer than the *Atlantick* ſea, but large and extended ſufficiently for this purpoſe. So now at laſt we are come to the Inſtance of the Croſs concerning this ſubject: which word is taken from Croſſes, which are ſet up in croſs ways, and point out the ſeparations of them. And theſe we uſe to call Deciſory and Judicial Inſtances, and in ſome caſes Inſtance of Oracle and mandate: The manner of them is this; When in the Inquiſition of ſome Nature, the underſtanding is ſuſpended and uncertain, to which of the two or more natures the Cauſe of the enquired Nature ought to be attributed and aſſigned, by reaſon of the frequent and ordinary concourſe of divers Natures; the inſtances of the Croſs do ſhew the faithful and indiſſoluble agreement (concerning the Nature which is enquired of) of one of the Natures, and the variable and ſeparable agreement of the other, whereby the queſtion is determined, and the former Nature is received for the cauſe, the other being rejected and laid aſide: And that is ſuch a one, if we find of a certainty, that when it flows on the oppoſite ſhoars as well of *Florida* and *Spain* in the *Atlantick* ſea, it flows alſo upon the ſhoars of *Peru*, and the back-ſide of *China* in the ſouth ſea: then by this Deciſorie Inſtance this Aſſertion muſt be confirmed, that the ebbing and flowing of the ſea which we enquire after, muſt be done by a Progreſſive Motion: For there is no other ſea or other place left where there can be a Regreſs or ebb made at the ſame time: And this may moſt eaſily be known, if one could enquire of the Inhabitants of *Panama* and *Lima* (where the Atlantick and Southern Ocean are ſevered only by a ſmall *Iſthmus*) whether the ebbing and flowing be at the ſame time on both ſides of the *Iſthmus* or no. But this Deciſion ſeems to be certain, if it be granted that the Earth ſtand immoveable. For if the Earth turns round, it may be that by unequal turning of it, (as touching the celerity & ſwiftneſs of it) and of the water of the ſea, there may be a violent driving of waters up into a heap, which may be the flowing, and a Re-laxation of the ſame, (when they can be heaped up no more) which may be the ebbing. But of this there muſt be an Inquiſition ſeverally. But this being alſo ſuppoſed, that ſtill remaineth ſtedfaſt, that there muſt be ſomewhere an ebbing of waters when there is a flowing in other places. Likewiſe let the latter motion of thoſe two which we ſuppoſed, be the enquired Nature: namely, the motion of the Sea raiſing it ſelf, and ſinking down again; if it ſo happen that (after the matter is diligently examined) the other Progreſſive motion which we have ſpoken of, be rejected: Then there will be ſuch a threefold way concerning this Nature; and of Neceſſity this motion by which waters in ebbings and flowings riſe and fall again, without any addition of waters coming to them, muſt be one of theſe three ways: Either that this abundance of waters comes out of the Entrails of the earth, and returns again into them: Or that there be no greater maſs of waters, but that the ſame waters, (without any increaſing of Quantity) are extended, or rarified, ſo that they ſpread themſelves into a larger dimenſion, and take up more room, and then reſtrain and contract themſelves again: Or that there is neither more quantity, nor larger extenſion, but that the ſame waters (as they are both in Quantity or Rarity and Denſity) do raiſe themſelves, and ſo fall again by and through ſome Magnetick power drawing them from above, and ſo by conſent riſe and fall again. So now (if you pleaſe) let the Inquiſition be reduced (laying aſide the two firſt Motions) to this laſt, and let us enquire whether there be any ſuch ſublation or raiſing made by conſent, or Magnetick power. But in the firſt place it is manifeſt that all the whole waters as they are laid in the hollow or concave place of the Sea, cannot be raiſed altogether, for then there would want ſome thing to ſucceed and be in the bottome: ſo that if there were any ſuch appetite or deſire in the waters of raiſing themſelves, yet that would be broken and cohibited by the connexion of things, or (as they commonly call it) by the Nonentity or not being of any vacuity. It remains therefore that the waters muſt riſe on the one ſide, or part, and thereby diminiſh and fall on the other. For again, it will of neceſſity follow, that the Magnetick power, ſeeing it cannot operate upon the whole, muſt needs operate moſt ſtrongly about the middle, ſo that raiſing the water in the middle, it muſt needs ſucceſſively abandon and forſake the ſhoars. So thus at laſt this ſubject is come to the Inſtance of the Croſs, which is this: That if it be found that in the ebbings of the ſea, the ſuperficies of the waters in the ſea is more arched and round, namely, the waters riſing in the middle of the ſea, and failing about the ſides, which are the ſhoars; and in the Flouds or Flowings the ſame ſuperficies is more plain and even, by reaſon of the waters returning to their firſt poſture: Then truly by this Deciſory Inſtance the raiſing by Magnetick power may be admitted of, otherwiſe it muſt be abſolutely rejected. But this may eaſily be tried in Arms of the ſea, by ſea lines, namely, whether in ebbs towards the middle of the ſea, the ſea be not deeper than in flouds. 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FINIS.

The Titles of the Hiſtories and Inquiſitions deſtined for the firſt ſix Months.

THe Hiſtory of Winds.
The Hiſtory of Denſity, and Rarity; as likewiſe of Coition and Expanſion of matter by ſpaces.
The Hiſtory of Heavy and Light.
The Hiſtory of the Sympathy, and Antipathy of things.
The Hiſtory of Sulphur, Mercury, and Salt.
The Hiſtory of Life and Death.

In this Book are contained;

THe Natural and Experimental Hiſtory of Winds.

The Natural and Experimental Hiſtory of the form of Heat.

Of the ſeveral kinds of Motion, or of the Active vertue.

The way to find out the cauſes of the Ebbing and Flowing of the Sea.

The Entry into the Hiſtory of Winds.

THe Winds gave Wings to men; for by their aſſiſtance men are carried up through the Air and flye; not through the Air indeed, but upon the Sea; and a wide door is laid open to commerce, and the World is made previous. They are the beſomes which ſweep and make clean the earth, which is the ſeat and habitation of mankind; and they cleanſe both it and the air: But they make the Sea hurtful, which otherwiſe is harmleſs, neither are they ſome other ways alſo, free from doing hurt: They are without help of man able to ſtir up great and vehement motions, and like Hirelings ſerve both to ſail and grind, and would be uſeful for many other things, if humane care were not wanting, Their Natures are reckoned amongſt ſecret and hidden things. Neither is that to be wondred at, ſeeing the Nature and Power of the Air is unknown, whom the Winds do ſerve and flatter, as Eolus *doth* Juno *in the Poets. They are not primary Creatures, nor any of the ſix days works, no more than the reſt of the Meteors actually, but after born, by the order of the Creation.*